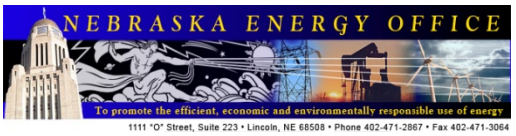


1111 "O" Street, Suite 223 • Lincoln, NE 68508 • Phone 402-471-2867 • Fax 402-471-3064

State of Nebraska
Department of
Administrative Services

Nebraska Energy Office
Lincoln, NE

Nebraska-specific Advanced Commercial Building Energy Code Study

Final Report Documentation

13 November 2009

Contract # 38617 04
Vendor # 517852
LAD Project # 002-10106-000

LEO A DALY

8600 INDIAN HILLS DRIVE
OMAHA, NE 68114-4039
TEL 402.391.8111
FAX 402.391.8564
www.leoadaly.com

PLANNING
ARCHITECTURE
ENGINEERING
INTERIORS

EST. 1915

TABLE OF CONTENTS

APPENDICIES

LIST OF TERMS AND ACRONYMS

AFUE	annual fuel utilization efficiency
AIRR	adjusted internal rate of return
ASHRAE	American Society of Heating, Refrigerating, and Air Conditioning Engineers, Inc.
Btu	british thermal unit; one Btu = energy required to raise one lb. of water one °F
CEE	Consortium for Energy Efficiency
c.i.	continuous insulation
CO_2	Carbon Dioxide
COP	coefficient of performance
DOE	Department of Energy
DHW	domestic hot water
DX	direct expansion
EER	energy efficiency ratio
EPAct	Energy Policy Act
ERV	energy recovery ventilator
FEMP	federal energy management program
HVAC	heating, ventilation, air conditioning
HW	hot water
IECC	International Energy Conservation Code
LCCA	life cycle cost analysis
LEED™	Leadership in Energy and Environmental Design
MMBtu	one million Btu
MUD	Metropolitan Utilities District
NEO	Nebraska Energy Office
NIST	National Institute of Standards and Technology
NOx	Nitrogen Oxides
NPPD	Nebraska Public Power District
NPV	net present value
OM&R	operating, maintenance, and repair
OPPD	Omaha Public Power District
PV	present value
R	thermal resistance
SEER	seasonal energy efficiency ratio
SIR	savings to investment ratio
SHGC	solar heat gain coefficient
SO_2	Sulfur Dioxide
SOW	scope of work
therm	one therm ≈ 100,000 Btu
U-value	thermal conductivity
VAV	variable air volume
VFD	variable frequency drive
VLT	visible light transmittance *also* VT
VSD	variable speed drive
WWR	window-to-wall ratio

Nebraska-Specific Advanced Commercial Building Energy Code Study

Executive Summary

The *Nebraska-Specific Advanced Commercial Building Energy Code Study* evaluated and quantified the potential economic, energy and environmental benefits to the State of Nebraska of adopting a Statewide Advanced Commercial Building Energy Code. The study also assessed the benefits associated with the reduction in carbon emissions and other environmental pollutants attributed to the generation and consumption of energy is commercial buildings.

An Increase of Between 1.28 and 3.36 Percent in Building Costs Achieves 30 Percent in Energy Savings

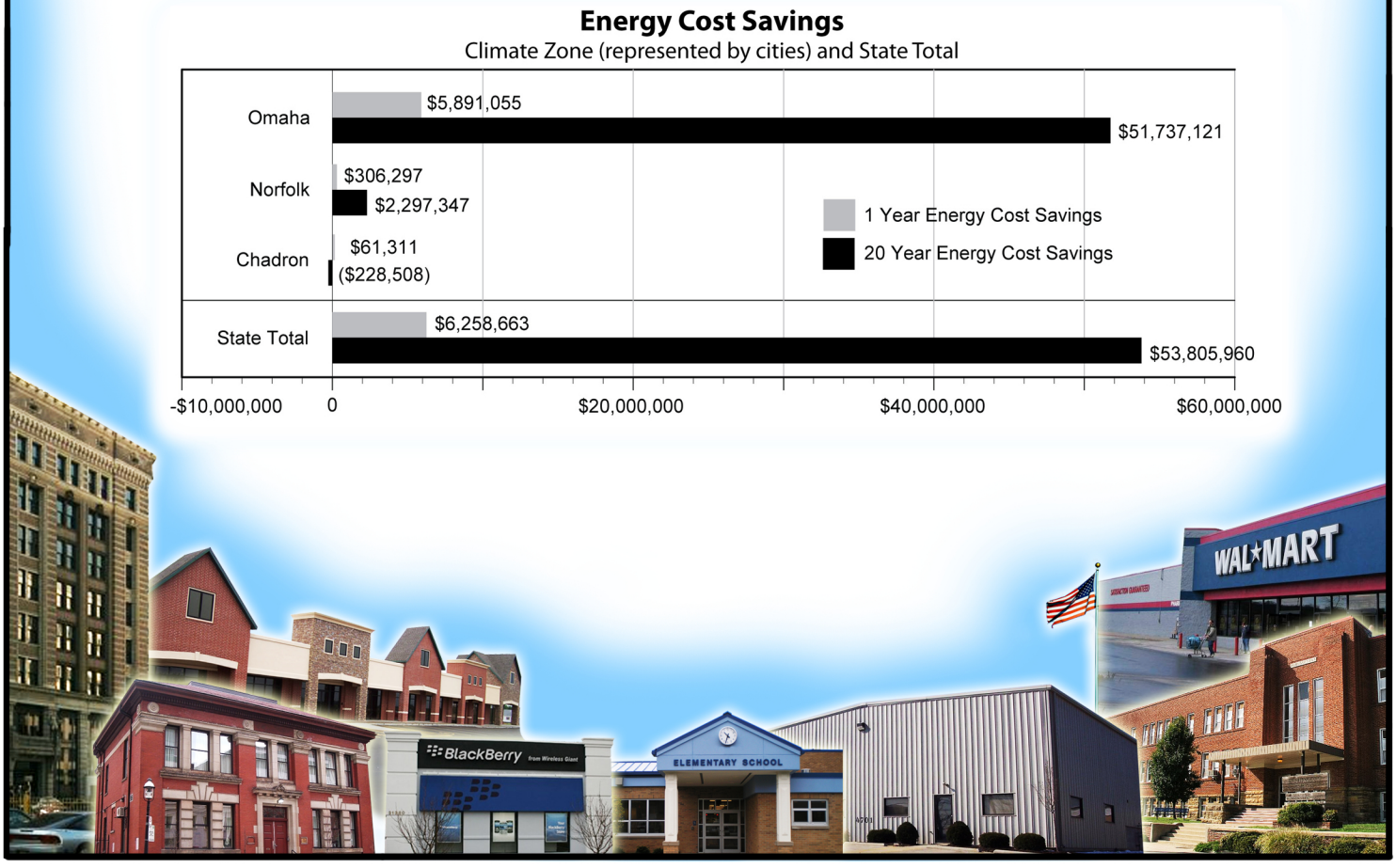
In the analysis of ten commercial building types in the state's three climate zones, the study found that an average incremental construction cost of between 1.28 and 3.36 percent would result in a 30 percent reduction in the energy savings in Nebraska.

After 20 Years, Energy Cost Savings in Commercial Buildings Total $53.8 Million

The study found energy cost savings associated with commercial buildings for the first year totaled $6.2 million and the 20 year cumulative life cycle cost savings exceeded $53.8 million. The specific energy cost savings are quantified by climate zone and for the state for one and 20 years in the figure below.

And the Savings Compound for All Nebraskans

While the commercial building owners are the immediate beneficiaries of the energy cost savings, the advanced building energy code's attributes will provide benefits for other Nebraskans. The 30 percent reduction in energy use will help shield all Nebraskans from future energy price fluctuations. The benefits to the state's economy include additional investments in construction costs of an estimated $63 million in the first year, primarily aiding local builders and supply companies. Since more than 80 percent of the money Nebraskans spend on energy leaves the state, any reduction in energy costs will have positive impact on the state's economy.



Methodology

This study focused on ten commonly constructed building models set in three representative climate zones of Nebraska: Chadron, Norfolk, and Omaha. Computer-based whole building energy models, intended to assess many aspects of building operation and design, were assembled to analyze each building type. The Omaha location proposed models for the ten building types were developed to achieve a 30-percent energy reduction over an ASHRAE Standard 90.1-2004 Appendix G compliant baseline building. Identical energy savings strategies were then utilized for Norfolk and Chadron models resulting in energy savings at approximately the 30-percent level.

All ten building types were found to be capable of achieving the 30-percent energy reduction by employing common building industry energy savings strategies. However, the application of specific strategies varied for each building type. High efficiency HVAC systems, energy recovery systems, enhanced wall insulation, increased roof insulation, high performance glazing, and high efficiency lighting represented the most common methods for demonstrating energy savings. Care was taken to focus on strategies not considered onerous or atypical to today's construction industry, but rather those that are routinely found in energy-responsible construction exceeding the current code-mandated minimum requirements. Additionally, building occupancy densities and operational schedules for each model were defaulted to ASHRAE-recommended values.

After achieving 30 percent energy savings in the models, the estimated capital, operating, maintenance and replacement costs for energy-affecting systems were developed and used with a 20-year comparative life cycle cost analysis (LCCA) between a model's baseline with the prescriptive requirements of the 2003 IECC and the proposed (energy-improved) building. The life cycle cost analysis, utilizing the U.S. Department of Energy FEMP analysis methodology, resulted in the economic indicators: net present value, simple and discounted payback periods, savings-to-investment ratio (SIR), and adjusted internal rate of return (AIRR). Finally, the analysis led to an environmental impact estimate related to the reduced release of carbon dioxide, nitrogen oxides, sulfur dioxide, and mercury.

Results

<u>Economic Impacts</u>

In general, the results of the life cycle cost analyses are mixed, with certain building models reflecting positive net present values and varying accompanying payback periods in favor of the 30-percent energy improved alternative models. An abbreviated summary of the life cycle cost analyses results follows in Table 1.

Conversely, other alternative building models do not reflect a beneficial net present worth or payback, in spite of positive annual energy cost savings when compared to the baseline model. The primary cause for cases failing to demonstrate a viable payback with the 30-percent alternative models is likely due to the magnitude of the periodic system and/or major component replacement costs when compared to baseline systems.

Building Model Description	Climate Zone	Payback (Yr)		SIR	AIRR [%]
		Simple	*Discounted*		
Large Office Building – 38% WWR	Omaha	Yes (14)	Yes (16)	1.83	6.17
	Norfolk	Yes (13)	Yes (16)	2.12	6.94
	Chadron	Yes (13)	Yes (15)	2.19	7.12
Large Office Building – 18% WWR	Omaha	Yes (16)	Yes (16)	1.41	4.78
	Norfolk	Yes (16)	Yes (18)	1.27	4.22
	Chadron	Yes (16)	Yes (20)	1.16	3.78
Small Office Building – 38% WWR	Omaha	Yes (20)	No	0.94	2.69
	Norfolk	Yes (20)	No	0.87	2.30
	Chadron	Yes (20)	No	0.99	2.95
Small Office Building – 18% WWR	Omaha	Yes (20)	No	0.72	1.29
	Norfolk	Yes (20)	No	0.71	1.27
	Chadron	Yes (20)	No	0.70	1.18
Small Retail Building	Omaha	Yes (8)	Yes(9)	2.91	8.64
	Norfolk	Yes (9)	Yes(10)	2.69	8.23
	Chadron	Yes (11)	Yes(11)	2.13	6.97
Retail Strip Mall	Omaha	Yes (8)	Yes(9)	2.59	8.02
	Norfolk	Yes (11)	Yes(16)	1.55	5.30
	Chadron	Yes (15)	Yes(16)	1.41	4.79
Large Big Box Retail	Omaha	Yes (Immediate)		N/A	N/A
	Norfolk	Yes (Immediate)		N/A	N/A
	Chadron	Yes (Immediate)		N/A	N/A
Elementary Education Building	Omaha	Yes (20)	Yes (20)	1.02	3.08
	Norfolk	Yes (20)	No	0.55	-0.02
	Chadron	No	No	0.08	-9.45
Secondary Education Building	Omaha	No	No	-	-
	Norfolk	No	No	-	-
	Chadron	No	No	-	-
Warehouse	Omaha	Yes (20)	No	0.56	0.04
	Norfolk	Yes (20)	No	0.63	0.63
	Chadron	Yes (20)	No	0.55	0.01

Table 1 - Life Cycle Cost Analyses Results Summary

Only capital investment costs related to building components, systems and equipment affecting energy usage were compared between the baseline and energy-improved models. Non-common capital investment costs (essentially those only impacting regulated energy consumption),typical periodic recurring preventative maintenance, and non-recurring maintenance and repair costs that differentiate each model were developed for use with each LCCA model. Additionally, for the purposes of evaluating the economic impacts of long-term financing on the differing model capital investments as relate to energy-contributing building systems, components and equipment, commercial (non-school) building models presume a 20-year fixed rate mortgage at 6.5%, and the elementary and secondary school building models presume a 20-year tax-exempt bond financing at 4.65%.

In the case of the elementary and secondary schools buildings, the study's scope-defined HVAC systems modeled for the alternative energy-improved models were rooftop air-to-air heat pumps. Although not deemed a viable choice to preserve the universal applicability of the study, prior LEO A DALY client experience with school district projects within Nebraska and surrounding states suggests that alternative HVAC systems, employing vertical bore ground-source geothermal heat pumps, have the potential to improve investment returns and typically realize payback periods under 10 years.

Using the utility rate schedules listed in Table 2, the Nebraska statewide total first year energy cost savings for the 30-percent (energy-improved) alternative buildings would amount to $6,258,689 over baseline buildings that comply with the currently-adopted State of Nebraska energy code (2003 IECC).

Utility	Omaha	Norfolk	Chadron
Electricity	OPPD Schedule 231	NPPD Schedule GS	NPPD Schedule GS
Natural Gas	MUD Schedule B	Black Hills Energy Schedule TSS	Source Gas provider average

Table 2 - Utility Rate Schedules by Location

Energy Impacts

This study clearly demonstrates that significant statewide reduction in future energy consumption could be achieved with the adoption of an Advanced Energy Code. An estimated accumulated 20-year energy savings of 108,738,240 MMBtu would result by the construction of 30-percent (energy-improved) alternative buildings when compared to their current code-minimum compliant counterparts. Table 3 below shows the 20-year cumulative energy savings for a single average building in each of the zones. Also shown is the statewide cumulative energy savings for all such commercial buildings potentially constructed and operated during the 20-year study period.

	Location Average Single Building			All Building Starts
	Omaha	*Norfolk*	*Chadron*	*Statewide Cumulative*
Cumulative Energy Savings [MMBtu]	11,443	12,207	9,761	108,738,240

Table 3 – 20 Year Cumulative Energy Consumption Savings

Treatment of Non-regulated Power (Plug) Loads

Although analyzed for their overall contribution to electricity consumption, cooling loads, and heating loads in the prototypical building models, for the purposes of this study, presently non-regulated building user power (plug) loads have been discounted in regard to their contributions toward potential energy savings percentage improvement reductions. Non-regulated plug loads typically include among others: appliances, computers, printers, and copiers. Incidentally, such treatment of plug loads is also the case for all federally-funded (non-LEED ™ certifiable targeted) energy-improved building projects, as permitted by EPAct 2005.

Environmental Impacts

A focus of the environmental impact assessment of this study was the reduction in carbon dioxide emissions, a detrimental atmospheric greenhouse gas, and other environmental pollutants created as by-products of energy production. Emissions are produced when fuels are combusted at off-site power plants producing electricity and by on-site heaters and furnaces producing heating energy. A reduction in the four major pollutants would be achieved by reducing commercial building demand for electricity and natural gas. Carbon dioxide, nitrogen oxides, sulfur dioxide, and mercury 20-year accumulated potential savings associated with the adoption of a statewide improved energy code are summarized in Table 4.

	Location Average Single Building			All Building Starts
Emission	*Omaha*	*Norfolk*	*Chadron*	*Statewide Cumulative*
Carbon Dioxide (CO_2) [lbs.]	2,074,725	1,745,949	2,115,678	19,479,889,792
Nitrogen Oxides (NO_x) [lbs.]	2,785	2,914	3,160	26,535,025
Sulfur Dioxide (SO_2) [lbs.]	11,114	10,566	9,629	104,866,423
Mercury (Hg) [mg]	8,804	4,216	11,661	81,087,531

Table 4 – 20 Year Cumulative Emissions Reductions

The Large Big Box Retail models demonstrated a counterintuitive increase in most emissions, despite a 30-percent reduction in energy consumption. This model achieved significant heating savings, drastically reducing its use of natural gas. However, requirements for increased fan power resulted in increased electricity consumption, driving up the overall associated carbon dioxide, nitrogen oxides, and mercury emissions compared to baseline model emissions.

Statewide Construction

Data sourced by the Nebraska Energy Office regarding annual construction starts by commercial building type were used to assess overall statewide impacts of an Advanced Energy Code. Over 92-percent of construction starts are located in the greater Omaha-metro representative climate region, including the Lincoln-Omaha interstate corridor. Therefore, aggregate statewide impacts are heavily weighted towards the Omaha results.
Historical construction data shows an average of 1,249 commercial buildings are constructed in Nebraska annually, involving an average 25,528 square feet per building. Located throughout the state, these buildings may or may not be located within a local code jurisdiction that presently categorizes data regarding the construction building type. Additionally, there are no statewide reporting standards, uniform or otherwise, for local code jurisdictions that presently track building construction type data.

For the purposes of this study, the cumulative statewide energy consumption, energy cost savings, incremental (delta) construction cost, and environmental emissions impacts for *modeled building types* constructed in Nebraska were determined by utilizing building type model energy consumption results developed as part of (eQUEST) energy modeling software analyses within the appropriate Nebraska State Energy Code Building Climate Zone, and applying this information to the model's corresponding

(BLCC) LCCA analysis, in turn multiplied by the total number of buildings, per building type and climate zone, as listed in Table 5 below. Note that building types not modeled in this study (i.e. hospitals, churches, theatres, industrial buildings, hotels) are not included in the annual construction start data. The ten building types represented by this study account for 903 of the 1249 historical commercial building construction starts.

Building Type	Zone 13b	Zone 14b	Zone 15
Large Office Building 38% Window-to-Wall Ratio	10 + 1 = 11	1 + 0 = 1	0 + 0 = 0
Large Office Building 18% Window-to-Wall Ratio	10 + 1 = 11	1 + 0 = 1	1 + 0 = 1
Small Office Building 38% Window-to-Wall Ratio	31 + 3 = 34	2 + 0 = 2	0 + 0 = 0
Small Office Building 18% Window-to-Wall Ratio	62 + 7 = 69	4 + 1 = 5	1 + 0 = 1
Small Retail Building	310 + 36 = 346	21 + 2 = 22	4 + 1 = 5
Strip Mall	133 + 16 = 149	9 + 1 = 10	1 + 0 = 1
Big Box Retail	88 + 10 = 98	6 + 1 = 7	1 + 0 = 1
Elementary Schools	40 + 5 = 45	3 + 0 = 3	1 + 0 = 1
Secondary Schools	20 + 2 = 22	1 + 1 = 2	1 + 0 = 1
Warehouse	44 + 5 = 49	3 + 1 = 4	1 + 0 = 1

Table 5 - Annual Commercial Building Construction Starts by Zone

Note: The first number in each category indicates the estimated number of buildings, per modeled building type, constructed in the top 40 most-populous communities in Nebraska. The second number indicates the estimated number of buildings, per modeled building type, constructed outside of Nebraska's 40 most-populous communities.

Life Cycle Cost Analysis (LCCA)

The life cycle cost models developed for this study are based on a 20-year life, employing (BLCC Version 5.3-09) life cycle software as provided through the U.S. Department of Commerce's National Institute of Standards and Technology, exercising the Federal Energy Management Program (FEMP) model structure analysis approach option.

Recommendations

The results of the study's energy modeling phases indicate that the differences in typical commercial building energy consumption between the 2003 IECC, Nebraska's currently-adopted energy code, and

the 2006 IECC edition are generally marginal, and not significant enough to warrant adoption of the 2006 IECC code edition at this juncture. Of the 30 total building models evaluated (10 prototypes, each at the 3 climate zones):

- 21 models resulted in having either net negative energy savings (ie. – increased energy consumption) or up to a 1-Percent improvement at best
- 3 models yielded energy improvements between 1 and 3-Percent
- 6 models showed energy improvement gains of greater than 3-Percent.

Of this latter group, Small Retail Facilities (statewide) carried the best potential for improved energy reduction, followed by Large Offices-18% WWR, Large Big Box Retail facilities, Secondary Schools and Elementary Schools, all in the Omaha climate zone. The tabulated results are listed in Table 6, page 9.

Generally, the 2003 IECC models located in Chadron performed better than the 2006 IECC models in the same zone. This is likely due to the 2006 IECC simplification of the climate zone definitions from the 2003 IECC edition. Three climate zones, 13b (Omaha), 14b (Norfolk), and 15 (Chadron) existed under the 2003 IECC, each with a unique set of prescriptive requirements. Depending upon the building window to wall ratio, the 2003 IECC also had unique prescriptive requirements for roof and wall insulation as subsets of each climate zone requirements. In the 2006 IECC and ASHRAE Standard 90.1-2004, Nebraska was redefined as one homogenous climate zone.

Conversely, this study clearly demonstrates that the State of Nebraska would positively benefit from the promulgation of a Nebraska-specific Statewide Advanced Energy Code based on a requirement for all new commercial building construction to achieve a minimum 30-percent energy savings improvement over comparable ASHRAE Standard 90.1-2004 compliant baseline buildings. The demonstrated benefits include:

- Economic – The amortization of increased capital investment outlays associated with new building construction constructed in compliance with an Advanced Energy Code may generally be more than offset through commensurate reductions in operating energy cost outlays over the building's life. Using average 2009 R.S. MEANS Cost Guide unit construction costs for the modeled buildings, and given the study-presumed construction starts by building type per climate zone, the Nebraska statewide impact on additional capital construction costs employing an Advanced Energy Code slightly exceeds $43 Million annually on an estimated $3.36 Billion in statewide construction, or approximately a 1.28-Percent average increase in construction cost per building. Individual building models represent construction cost variations from as low as nearly a 1.4-Percent cost savings in construction for Large Big Box Retail facilities, to as high as 7.6-Percent added average construction cost for Retail Strip Malls to obtain the 30-Percent targeted energy savings over ASHRAE Standard 90.1-2004.

- Reduced Energy Consumption – The statewide annual energy savings (refer to Table 3, page 4) are approximately $6.3 Million annually, which translates into tangential benefits for the public utility services being afforded opportunities to delay having to implement (build) larger or add

additional generating capacity and the associated interstate energy transmission/delivery infrastructure to support new commercial building construction.

- Positive Environmental Impacts – The demonstrated reductions in such pollutants resulting from the implementation of an Advanced Energy Code for Nebraska can be related to other studies sponsored by various U.S. Federal Government Agencies such as the Environmental Protection Agency linking increases in the evaluated pollutants as hazardous to individual health, the earth's atmosphere (ozone layer degradation), and land, lakes and waterway resources. Reducing the additional amounts of these pollutants associated with new construction is beneficial to both the State of Nebraska and the world at-large. Initiatives favoring environmental pollution reduction are not only currently deemed 'politically correct' by an ever-growing percentage of the population, but are also deemed as good stewardship considerate of future generations by many others.

Additionally, although not modeled as part of this study, it can be readily deduced that by including requirements within such an Advanced Energy Code for applicability to substantial (area) additions and major renovations of existing commercial buildings, similar benefits would accrue to the State.

Building Model Description	Climate Zone	Minimally Code Compliant Building Energy Consumption [MMbtu]		
		2003 IECC	*2006 IECC*	*% Reduction*
Large Office Building – 38% WWR	Omaha	2934	2932	0.1%
	Norfolk	2982	3001	-0.6%
	Chadron	2608	2710	-3.9%
Large Office Building – 18% WWR	Omaha	2624	2511	4.3%
	Norfolk	2558	2555	0.1%
	Chadron	2304	2311	-0.3%
Small Office Building – 38% WWR	Omaha	441	450	-2.0%
	Norfolk	448	469	-4.7%
	Chadron	413	423	-2.4%
Small Office Building – 18% WWR	Omaha	395	398	-0.8%
	Norfolk	407	417	-2.5%
	Chadron	366	374	-2.2%
Small Retail Building	Omaha	510	482	5.5%
	Norfolk	548	516	5.8%
	Chadron	474	445	6.1%
Retail Strip Mall	Omaha	2174	2155	0.9%
	Norfolk	2281	2257	1.1%
	Chadron	1975	1956	1.0%
Large Big Box Retail	Omaha	6861	6605	3.7%
	Norfolk	6870	6838	0.5%
	Chadron	6122	6048	1.2%
Elementary Education Building	Omaha	2779	2703	2.7%
	Norfolk	2792	2835	-1.5%
	Chadron	2285	2319	-1.5%
Secondary Education Building	Omaha	4163	4011	3.7%
	Norfolk	4170	4149	0.5%
	Chadron	3705	3692	0.4%
Warehouse	Omaha	1417	1411	0.4%
	Norfolk	1545	1542	0.2%
	Chadron	1382	1380	0.1%

Table 6 - Comparative Performance of Minimally Code Compliant Buildings under 2003 IECC and 2006 IECC

Analysis Summaries

Selected data from the aforementioned study models is summarized in the following Analysis Summary spreadsheets, in addition to the inclusion of various salient economic and atmospheric emission statistics for each building model. In addition to the BLCC LCCA report output documentation contained herein are analysis summary spreadsheets for each building model comparison portraying select resultant model statistics for building energy consumption type (electricity and natural gas), economic (capital investment and mortgage/bond-related costs), and atmospheric pollution related characteristics.

Nebraska-specific Advanced Commercial Building Energy Code Study

Master Summary

Model	Variable	Unit	Omaha [a]	Norfolk [a]	Chadron [a]	State-wide Impact [b]
Large Office 38%	LCCA Net Present Worth	[$]	141,315	172,244	184,688	1,726,709
	First year energy cost savings	[$]	5,475	7,779	11,531	68,004
	Accumulated 20 year energy consumption savings	[MMBtu]	17,160	17,718	12,816	2,168,004
	Accumulated 20 year CO2 reduction	[lbs]	3,750,694	4,249,069	4,477,180	477,820,400
	Annual whole building site energy use intensity (EUI)	[kBtu/sf-yr]	34.61	34.94	32.79	34.64
Large Office 18%	LCCA Net Present Worth	[$]	53,523	46,030	25,604	660,387
	First year energy cost savings	[$]	7,104	9,341	9,011	96,496
	Accumulated 20 year energy consumption savings	[MMBtu]	16,748	15,438	12,978	2,232,732
	Accumulated 20 year CO2 reduction	[lbs]	4,672,657	3,473,442	4,133,959	619,569,540
	Annual whole building site energy use intensity (EUI)	[kBtu/sf-yr]	29.77	29.77	27.58	29.60
Small Office 38%	LCCA Net Present Worth	[$]	-3,898	-8,164	-612	-148,860
	First year energy cost savings	[$]	1,845	1,563	1,680	65,856
	Accumulated 20 year energy consumption savings	[MMBtu]	2,418	2,380	2,098	913,180
	Accumulated 20 year CO2 reduction	[lbs]	846,366	793,913	982,387	318,824,657
	Annual whole building site energy use intensity (EUI)	[kBtu/sf-yr]	31.99	32.89	30.80	32.04
Small Office 18%	LCCA Net Present Worth	[$]	-15,999	-14,929	-15,357	-1,193,933
	First year energy cost savings	[$]	1,447	1,297	1,056	107,384
	Accumulated 20 year energy consumption savings	[MMBtu]	2,128	2,290	1,784	1,680,682
	Accumulated 20 year CO2 reduction	[lbs]	599,279	588,710	455,312	469,865,448
	Annual whole building site energy use intensity (EUI)	[kBtu/sf-yr]	28.69	29.26	27.69	28.71
Small Retail	LCCA Net Present Worth	[$]	44,558	41,961	25,480	16,467,610
	First year energy cost savings	[$]	2,035	2,088	1,949	759,817
	Accumulated 20 year energy consumption savings	[MMBtu]	3,350	3,924	3,408	13,255,913
	Accumulated 20 year CO2 reduction	[lbs]	885,708	939,879	860,929	3,480,088,338
	Annual whole building site energy use intensity (EUI)	[kBtu/sf-yr]	67.90	70.30	60.68	67.94
Retail Strip Mall	LCCA Net Present Worth	[$]	156,642	53,358	35,208	23,908,446
	First year energy cost savings	[$]	15,636	9,108	7,734	2,428,578
	Accumulated 20 year energy consumption savings	[MMBtu]	13,844	15,570	12,730	23,427,499
	Accumulated 20 year CO2 reduction	[lbs]	4,278,361	4,385,075	3,756,652	7,193,372,978
	Annual whole building site energy use intensity (EUI)	[kBtu/sf-yr]	109.78	111.29	99.15	109.81
Big Box Retail	LCCA Net Present Worth	[$]	303,163	336,866	458,965	32,527,001
	First year energy cost savings	[$]	10,919	6,511	6,705	1,122,344
	Accumulated 20 year energy consumption savings	[MMBtu]	40,669	37,211	31,897	44,917,801
	Accumulated 20 year CO2 reduction	[lbs]	-1,566,839	-5,659,367	-4,760,647	-2,078,227,735
	Annual whole building site energy use intensity (EUI)	[kBtu/sf-yr]	48.28	50.09	45.27	48.37
Elementary School	LCCA Net Present Worth	[$]	2,112	-53,498	-110,272	-175,726
	First year energy cost savings	[$]	17,483	13,349	8,370	835,152
	Accumulated 20 year energy consumption savings	[MMBtu]	16,809	17,459	11,714	8,615,391
	Accumulated 20 year CO2 reduction	[lbs]	9,629,742	10,018,141	6,146,940	4,930,167,345
	Annual whole building site energy use intensity (EUI)	[kBtu/sf-yr]	38.77	38.38	33.99	38.65
Secondary School	LCCA Net Present Worth	[$]	-670,001	-646,574	-692,847	-16,726,017
	First year energy cost savings	[$]	21,975	19,199	14,606	536,454
	Accumulated 20 year energy consumption savings	[MMBtu]	25,417	26,127	20,799	6,638,429
	Accumulated 20 year CO2 reduction	[lbs]	13,696,142	14,109,395	10,518,037	3,570,545,434
	Annual whole building site energy use intensity (EUI)	[kBtu/sf-yr]	36.16	35.80	33.31	36.02
Warehouse	LCCA Net Present Worth	[$]	-61,048	-47,774	-57,209	-3,239,657
	First year energy cost savings	[$]	4,408	4,632	4,084	238,604
	Accumulated 20 year energy consumption savings	[MMBtu]	8,532	9,830	8,196	4,888,608
	Accumulated 20 year CO2 reduction	[lbs]	867,405	1,019,875	833,239	497,863,388
	Annual whole building site energy use intensity (EUI)	[kBtu/sf-yr]	20.64	21.94	20.25	20.73
Total Advanced Energy Code Impact	LCCA Net Present Worth	[$]	62,035	40,304	-19,042	53,805,960
	First year energy cost savings	[$]	7,064	5,374	5,109	6,258,689
	Accumulated 20 year energy consumption savings	[MMBtu]	11,443	12,207	9,761	108,738,240
	Accumulated 20 year CO2 reduction	[lbs]	2,074,725	1,745,949	2,115,678	19,479,889,792
	Annual whole building site energy use intensity (EUI)	[kBtu/sf-yr]	48.71	48.58	37.91	48.53

Notes: (a) Figure accounts for single building operation during applicable time frame
(b) Figure accounts for cumulative effects of all construction starts during applicable time-frame

Nebraska-specific Advanced Commercial Building Energy Code Study

Total Building Construction Cost Increase

Model	Annual Construction Starts [a]	Model Area	Typical Area-based Cost [b]	Typical Model Total Cost	30% Energy Saving Building Average Incremental Cost [c], [d]	
		[sf]	[$/sf]	[$]	[$]	[%]
Large Office 18% WWR	13	60000	$170	$10,200,000	$275,526	2.70%
Large Office 38% WWR	12	60000	$174	$10,440,000	$319,990	3.07%
Subtotal	*25*			*$257,880,000*	*$7,421,718*	*2.88%*
Small Office 18% WWR	75	10000	$201	$2,010,000	$81,753	4.07%
Small Office 38% WWR	36	10000	$206	$2,060,000	$94,660	4.60%
Subtotal	*111*			*$224,910,000*	*$9,539,235*	*4.24%*
Small Retail	373	5000	$125	$625,000	$23,771	3.80%
Subtotal				*$233,125,000*	*$8,866,583*	*3.80%*
Retail Strip Mall	160	13500	$110	$1,485,000	$112,384	7.57%
Subtotal				*$237,600,000*	*$17,981,440*	*7.57%*
Large Big Box Retail	106	100000	$138	$13,800,000	-$195,347	-1.42%
Subtotal				*$1,462,800,000*	*-$20,706,782*	*-1.42%*
Warehouse	54	48000	$90	$4,320,000	$196,349	4.55%
Subtotal				*$233,280,000*	*$10,602,846*	*4.55%*
Elementary School	49	50000	$159	$7,955,000	$181,443	2.28%
Subtotal				*$389,795,000*	*$8,890,707*	*2.28%*
Secondary School	25	80000	$162	$12,960,000	$18,520	0.14%
Subtotal				*$324,000,000*	*$463,000*	*0.14%*
Total Average Statewide Construction Cost Increase				**$3,363,390,000**	**$43,058,747**	**1.28%**
Total excluding Big Box Retail				*$1,900,590,000*	*$63,765,529*	*3.36%*

Notes:
(a) Annual construction start data as provided by NEO
(b) Typical area-based costs based upon from RSMeans 2009 Square Foot Costs
(c) Average incremental costs of 30-percent energy saving alternative buildings over baseline buildings from capital cost estimate
(d) Percent additional cost over typical model total cost

Nebraska-specific Advanced Commercial Building Energy Code Study

Analysis Summary

LEO A DALY

LARGE OFFICE 38% WWR

Location	Energy		Cost	2003 IECC to 2006 IECC Comparison						2003 IECC to 30% Alternative Comparison											
				Energy Consumption						Energy Consumption											
	Annual Energy Consumption	Annual Energy Cost	Capital Investment Cost (Note a)	Annual Savings	Accumulated 20 YR Savings	First Year Energy Cost Savings	Mortgage Cost-Energy Cost Savings (Year 1)	Capital Investment Cost Δ	20 Year Mortgage Cost Δ	Annual Savings	Accumulated 20 YR Savings	First Year Energy Cost Savings	Mortgage Costs-Energy Cost Savings (Year 1)	Capital Investment Cost Δ	20 Year Mortgage Cost Δ	LCCA Net Present Worth Δ	Environmental Impact Emission Reductions				Construction Starts (Note b)	
		[$]	[$]			[$]	[$]	[$]	[$]			[$]	[$]	[$]	[$]	[$]	CO2 [lbs]	NOx [lbs]	SO2 [lbs]	Hg [mg]	[#]	[%]
OMAHA																					**11**	**91.67%**
Total [MMBtu]				**2**	**34**	**45**	**-617**	**-6,392**	**-11,444**	**858**	**17,160**	**5,475**	**23,362**	**322,128**	**576,738**	**141,315**	**187,535**	**277**	**854**	**986**	**Annual Emmissions Savings**	
Elec [kWh]				1,643	32,860	81				46,071	921,420	-1,320					106,093	214	196	986	***(per single bldg)***	
Gas [therm]				-39	-780	-36				7,008	140,160	6,795					81,441	63	657	0		
2003 IECC																						
Total [MMBtu]	***2,934***	***48,502***	***617,020***																			
Elec [kWh]	*654,545*	*41,707*															**2,062,882**	**3,050**	**9,391**	**10,843**	**Annual Emmissions Savings**	
Gas [therm]	*7,008*	*6,795*															1,167,028	2,352	2,161	10,843	***(all bldgs this zone)***	
2006 IECC																	895,854	698	7,230	0		
Total [MMBtu]	***2,932***	***48,457***	***610,628***																			
Elec [kWh]	*652,902*	*41,626*																				
Gas [therm]	*7,047*	*6,831*																				
30% Alternative																						
Total [MMBtu]	***2,076***	***43,027***	***939,148***																			
Elec [kWh]	*608,474*	*43,027*																				
Gas [therm]	*0*	*0*																				
NORFOLK																					**1**	**8.33%**
Total [MMBtu]				**-19**	**-372**	**1,499**	**-4,682**	**-35,552**	**-63,652**	**886**	**17,718**	**7,779**	**18,761**	**296,468**	**530,796**	**172,244**	**212,453**	**329**	**892**	**1,229**	**Annual Emmissions Savings**	
Elec [kWh]				39,333	786,660	2,680				57,442	1,148,840	1,878					132,279	267	245	1,229	***(per single bldg)***	
Gas [therm]				-1,528	-30,560	-1,181				6,899	137,980	5,901					80,175	62	647	0		
2003 IECC																						
Total [MMBtu]	***2,982***	***50,801***	***642,680***																			
Elec [kWh]	*671,895*	*44,900*															**212,453**	**329**	**892**	**1,229**	**Annual Emmissions Savings**	
Gas [therm]	*6,899*	*5,901*															132,279	267	245	1,229	***(all bldgs this zone)***	
2006 IECC																	80,175	62	647	0		
Total [MMBtu]	***3,001***	***49,302***	***607,128***																			
Elec [kWh]	*632,562*	*42,220*																				
Gas [therm]	*8,427*	*7,082*																				
30% Alternative																						
Total [MMBtu]	***2,097***	***43,022***	***939,148***																			
Elec [kWh]	*614,453*	*43,022*																				
Gas [therm]	*0*	*0*																				
CHADRON																					**0**	**0.00%**
Total [MMBtu]				**-102**	**-2,044**	**528**	**-3,711**	**-35,552**	**-63,652**	**641**	**12,816**	**11,531**	**14,642**	**292,368**	**523,456**	**184,688**	**223,859**	**398**	**684**	**1,677**	**Annual Emmissions Savings**	
Elec [kWh]				35,142	702,840	2,451				78,367	1,567,340	8,297					180,466	364	334	1,677	***(per single bldg)***	
Gas [therm]				-2,221	-44,420	-1,923				3,734	74,680	3,234					43,393	34	350	0		
2003 IECC																						
Total [MMBtu]	***2,608***	***46,954***	***642,180***																			
Elec [kWh]	*654,984*	*43,720*															**0**	**0**	**0**	**0**	**Annual Emmissions Savings**	
Gas [therm]	*3,734*	*3,234*															0	0	0	0	***(all bldgs this zone)***	
2006 IECC																	0	0	0	0		
Total [MMBtu]	***2,710***	***46,426***	***606,628***																			
Elec [kWh]	*619,842*	*41,269*																				
Gas [therm]	*5,955*	*5,157*																				
30% Alternative																						
Total [MMBtu]	***1,967***	***35,423***	***934,548***																			
Elec [kWh]	*576,617*	*35,423*																				
Gas [therm]	*0*	*0*																				
STATE-WIDE																					**12**	**100.00%**
Total [MMBtu]				**0**	**36**	**1,994**	**-11,471**	**-105,864**	**-189,539**	**10,324**	**2,168,004**	**68,004**	**275,742**	**3,839,876**	**6,874,914**	**1,726,709**	**2,275,335**	**3,379**	**10,283**	**12,072**	**Annual Emmissions Savings**	
Elec [kWh]				57,406	12,055,260	3,571				564,223	118,486,830	-12,642					1,299,307	2,619	2,406	12,072	***(all bldgs statewide)***	
Gas [therm]				-1,957	-410,970	-1,577				83,987	17,637,270	80,646					976,028	760	7,877	0		

NOTES: (a) Building Components / Systems Affecting Energy Consumption ONLY.
(b) Assumed Annual Construction Starts by Region - Data as provided by the Nebraska Energy Office

Nebraska-specific Advanced Commercial Building Energy Code Study

Analysis Summary

LARGE OFFICE 18% WWR

LEO A DALY

Location	Energy		Cost	2003 IECC to 2006 IECC Comparison						2003 IECC to 30% Alternative Comparison												
				Energy Consumption						Energy Consumption							Environmental Impact Emission Reductions				Construction Starts	
	Annual Energy Consumption	Annual Energy Cost [$]	Capital Investment Cost (Note a) [$]	Annual Savings	Accumulated 20 YR Savings	First Year Energy Cost Savings [$]	Mortgage Cost-Energy Cost Savings (Year 1) [$]	Capital Investment Cost Δ [$]	20 Year Mortgage Cost Δ [$]	Annual Savings	Accumulated 20 YR Savings	First Year Energy Cost Savings [$]	Mortgage Costs-Energy Cost Savings (Year 1) [$]	Capital Investment Cost Δ [$]	20 Year Mortgage Cost Δ [$]	LCCA Net Present Worth Δ [$]	CO2 [lbs]	NOx [lbs]	SO2 [lbs]	Hg [mg]	(Note b) [#]	[%]
OMAHA																					**11**	**84.62%**
Total [MMBtu]				**113**	**2,262**	**1,739**	**-1,004**	**8,208**	**14,696**	**837**	**16,748**	**7,104**	**16,979**	**269,028**	**481,668**	**53,523**	**233,633**	**386**	**861**	**1,530**	**Annual Emmissions Savings**	
Elec [kWh]				34,852	697,040	1,418				71,509	1,430,180	1,317					164,673	332	305	**1,530**	***(per single bldg)***	
Gas [therm]				-58	-1,160	321				5,934	118,680	5,787					68,960	54	557	**0**		
2003 IECC																						
Total [MMBtu]	***2,624***	***43,938***	***405,800***																			
Elec [kWh]	*595,022*	*38,151*															**2,569,961**	**4,242**	**9,476**	**16,829**	**Annual Emmissions Savings**	
Gas [therm]	*5,934*	*5,787*															1,811,400	3,651	3,355	16,829	***(all bldgs this zone)***	
2006 IECC																	758,561	591	6,122	0		
Total [MMBtu]	***2,511***	***42,199***	***414,008***																			
Elec [kWh]	*560,170*	*36,733*																				
Gas [therm]	*5,992*	*5,466*																				
30% Alternative																						
Total [MMBtu]	***1,786***	***36,834***	***674,828***																			
Elec [kWh]	*523,513*	*36,834*																				
Gas [therm]	*0*	*0*																				
NORFOLK																					**1**	**7.69%**
Total [MMBtu]				**3**	**60**	**757**	**-1,724**	**-10,800**	**-19,336**	**772**	**15,438**	**9,341**	**19,665**	**324,020**	**580,125**	**46,030**	**173,672**	**261**	**771**	**942**	**Annual Emmissions Savings**	
Elec [kWh]				18,470	369,400	1,252				44,048	880,960	4,004					101,435	204	188	**942**	***(per single bldg)***	
Gas [therm]				-600	-12,000	-495				6,216	124,320	5,337					72,237	56	583	**0**		
2003 IECC																						
Total [MMBtu]	***2,558***	***43,245***	***592,428***																			
Elec [kWh]	*567,561*	*37,908*															**173,672**	**261**	**771**	**942**	**Annual Emmissions Savings**	
Gas [therm]	*6,216*	*5,337*															101,435	204	188	942	***(all bldgs this zone)***	
2006 IECC																	72,237	56	583	0		
Total [MMBtu]	***2,555***	***42,488***	***581,628***																			
Elec [kWh]	*549,091*	*36,656*																				
Gas [therm]	*6,816*	*5,832*																				
30% Alternative																						
Total [MMBtu]	***1,786***	***33,904***	***916,448***																			
Elec [kWh]	*523,513*	*33,904*																				
Gas [therm]	*0*	*0*																				
CHADRON																					**1**	**7.69%**
Total [MMBtu]				**-7**	**-144**	**838**	**-1,805**	**-10,800**	**-19,336**	**649**	**12,978**	**9,011**	**17,713**	**298,520**	**534,470**	**25,604**	**206,698**	**357**	**682**	**1,473**	**Annual Emmissions Savings**	
Elec [kWh]				13,195	263,900	1,290				68,871	1,377,420	5,426					158,598	320	294	**1,473**	***(per single bldg)***	
Gas [therm]				-522	-10,440	-452				4,139	82,780	3,585					48,100	37	388	**0**		
2003 IECC																						
Total [MMBtu]	***2,304***	***40,500***	***579,428***																			
Elec [kWh]	*553,904*	*36,915*															**206,698**	**357**	**682**	**1,473**	**Annual Emmissions Savings**	
Gas [therm]	*4,139*	*3,585*															158,598	320	294	1,473	***(all bldgs this zone)***	
2006 IECC																	48,100	37	388	0		
Total [MMBtu]	***2,311***	***39,662***	***568,628***																			
Elec [kWh]	*540,709*	*35,625*																				
Gas [therm]	*4,661*	*4,037*																				
30% Alternative																						
Total [MMBtu]	***1,655***	***31,489***	***877,948***																			
Elec [kWh]	*485,033*	*31,489*																				
Gas [therm]	*0*	*0*																				
STATE-WIDE																					**13**	**100.00%**
Total [MMBtu]				**1,240**	**260,422**	**20,724**	**-14,575**	**68,688**	**122,979**	**10,632**	**2,232,732**	**96,496**	**224,151**	**3,581,848**	**6,412,941**	**660,387**	**2,950,331**	**4,860**	**10,929**	**19,245**	**Annual Emmissions Savings**	
Elec [kWh]				415,037	87,157,770	18,140				899,518	188,898,780	23,917					2,071,433	4,175	3,836	19,245	***(all bldgs statewide)***	
Gas [therm]				-1,760	-369,600	2,584				75,629	15,882,090	72,579					878,898	685	7,093	0		

NOTES: (a) Building Components / Systems Affecting Energy Consumption ONLY.
(b) Assumed Annual Construction Starts by Region - Data as provided by the Nebraska Energy Office

Nebraska-specific Advanced Commercial Building Energy Code Study

Analysis Summary

LEO A DALY

SMALL OFFICE 38% WWR

Location	Energy		Cost	2003 IECC to 2006 IECC Comparison						2003 IECC to 30% Alternative Comparison												
				Energy Consumption						Energy Consumption												
	Annual Energy Consumption	Annual Energy Cost [$]	Capital Investment Cost (Note a) [$]	Annual Savings	Accumulated 20 YR Savings	First Year Energy Cost Savings [$]	Mortgage Cost-Energy Cost Savings (Year 1) [$]	Capital Investment Cost Δ [$]	20 Year Mortgage Cost Δ [$]	Annual Savings	Accumulated 20 YR Savings	First Year Energy Cost Savings [$]	Mortgage Costs-Energy Cost Savings (Year 1) [$]	Capital Investment Cost Δ [$]	20 Year Mortgage Cost Δ [$]	LCCA Net Present Worth Δ [$]	Environmental Impact Emission Reductions CO2 [lbs]	NOx [lbs]	SO2 [lbs]	Hg [mg]	Construction Starts (Note b) [#]	[%]
OMAHA																					**34**	**94.44%**
Total [MMBtu]				**-9**	**-186**	**-83**	**-594**	**-7,566**	**-13,546**	**121**	**2,418**	**1,845**	**6,648**	**94,876**	**169,866**	**-3,898**	**42,318**	**75**	**129**	**317**	**Annual Emmissions Savings**	
Elec [kWh]				524	10,480	21				14,829	296,580	1,184					34,149	69	63	317	***(per single bldg)***	
Gas [therm]				-111	-2,220	-104				703	14,060	661					8,170	6	66	0		
2003 IECC																						
Total [MMBtu]	***441***	***7,499***	***177,882***																			
Elec [kWh]	*84,844*	*5,877*															**1,438,821**	**2,557**	**4,392**	**10,787**	**Annual Emmissions Savings**	
Gas [therm]	*1,513*	*1,622*															1,161,052	2,340	2,151	10,787	***(all bldgs this zone)***	
2006 IECC																	277,769	216	2,242	0		
Total [MMBtu]	***450***	***7,582***	***170,316***																			
Elec [kWh]	*84,320*	*5,856*																				
Gas [therm]	*1,624*	*1,726*																				
30% Alternative																						
Total [MMBtu]	***320***	***5,654***	***272,758***																			
Elec [kWh]	*70,015*	*4,693*																				
Gas [therm]	*810*	*961*																				
NORFOLK																					**2**	**5.56%**
Total [MMBtu]				**-21**	**-420**	**-148**	**-1,234**	**-15,442**	**-27,647**	**119**	**2,380**	**1,563**	**6,583**	**91,000**	**162,926**	**-8,164**	**39,696**	**70**	**126**	**290**	**Annual Emmissions Savings**	
Elec [kWh]				641	12,820	44				13,569	271,380	963					31,247	63	58	290	***(per single bldg)***	
Gas [therm]				-232	-4,640	-192				727	14,540	600					8,449	7	68	0		
2003 IECC																						
Total [MMBtu]	***448***	***7,326***	***183,258***																			
Elec [kWh]	*82,236*	*5,741*															**79,391**	**139**	**252**	**581**	**Annual Emmissions Savings**	
Gas [therm]	*1,673*	*1,585*															62,494	126	116	581	***(all bldgs this zone)***	
2006 IECC																	16,897	13	136	0		
Total [MMBtu]	***469***	***7,474***	***167,816***																			
Elec [kWh]	*81,595*	*5,697*																				
Gas [therm]	*1,905*	*1,777*																				
30% Alternative																						
Total [MMBtu]	***329***	***5,763***	***274,258***																			
Elec [kWh]	*68,667*	*4,778*																				
Gas [therm]	*946*	*985*																				
CHADRON																					**0**	**0.00%**
Total [MMBtu]				**-10**	**-206**	**176**	**-1,558**	**-15,442**	**-27,647**	**105**	**2,098**	**1,680**	**6,063**	**86,500**	**154,870**	**-612**	**49,119**	**93**	**119**	**414**	**Annual Emmissions Savings**	
Elec [kWh]				6,972	139,440	471				19,372	387,440	1,344					44,610	90	83	414	***(per single bldg)***	
Gas [therm]				-341	-6,820	-295				388	7,760	336					4,509	4	36	0		
2003 IECC																						
Total [MMBtu]	***413***	***7,093***	***184,258***																			
Elec [kWh]	*87,863*	*6,113*															**0**	**0**	**0**	**0**	**Annual Emmissions Savings**	
Gas [therm]	*1,132*	*980*															0	0	0	0	***(all bldgs this zone)***	
2006 IECC																	0	0	0	0		
Total [MMBtu]	***423***	***6,917***	***168,816***																			
Elec [kWh]	*80,891*	*5,642*																				
Gas [therm]	*1,473*	*1,275*																				
30% Alternative																						
Total [MMBtu]	***308***	***5,413***	***270,758***																			
Elec [kWh]	*68,491*	*4,769*																				
Gas [therm]	*744*	*644*																				
STATE-WIDE																					**36**	**100.00%**
Total [MMBtu]				**-359**	**-75,314**	**-3,118**	**-22,675**	**-288,128**	**-515,864**	**4,348**	**913,180**	**65,856**	**239,209**	**3,407,784**	**6,101,296**	**-148,860**	**1,518,213**	**2,696**	**4,644**	**11,368**	**Annual Emmissions Savings**	
Elec [kWh]				19,098	4,010,580	802				531,324	111,578,040	42,182					1,223,546	2,466	2,266	11,368	***(all bldgs statewide)***	
Gas [therm]				-4,238	-889,980	-3,920				25,356	5,324,760	23,674					294,666	229	2,378	0		

NOTES: (a) Building Components / Systems Affecting Energy Consumption ONLY.
(b) Assumed Annual Construction Starts by Region - Data as provided by the Nebraska Energy Office

Nebraska-specific Advanced Commercial Building Energy Code Study

Analysis Summary

SMALL OFFICE 18% WWR

LEO A DALY

Location	Energy		Cost	2003 IECC to 2006 IECC Comparison						2003 IECC to 30% Alternative Comparison												
				Energy Consumption						Energy Consumption							Environmental Impact Emission Reductions				Construction Starts	
	Annual Energy Consumption	Annual Energy Cost [$]	Capital Investment Cost (Note a) [$]	Annual Savings	Accumulated 20 YR Savings	First Year Energy Cost Savings [$]	Mortgage Cost-Energy Cost Savings (Year 1) [$]	Capital Investment Cost Δ [$]	20 Year Mortgage Cost Δ [$]	Annual Savings	Accumulated 20 YR Savings	First Year Energy Cost Savings [$]	Mortgage Costs-Energy Cost Savings (Year 1) [$]	Capital Investment Cost Δ [$]	20 Year Mortgage Cost Δ [$]	LCCA Net Present Worth Δ [$]	CO2 [lbs]	NOx [lbs]	SO2 [lbs]	Hg [mg]	(Note b) [#]	[%]
OMAHA																					**69**	**92.00%**
Total [MMBtu]				**-3**	**-56**	**-51**	**27**	**-266**	**-476**	**106**	**2,128**	**1,447**	**5,908**	**82,157**	**147,094**	**-15,999**	**29,964**	**50**	**110**	**198**	**Annual Emmissions Savings**	
Elec [kWh]				320	6,400	13				9,232	184,640	755					21,260	43	39	198	***(per single bldg)***	
Gas [therm]				-39	-780	-64				749	14,980	692					8,704	7	70	0		
2003 IECC																						
Total [MMBtu]	***395***	***6,645***	***167,582***																			
Elec [kWh]	*75,349*	*5,178*															**2,067,511**	**3,425**	**7,564**	**13,629**	**Annual Emmissions Savings**	
Gas [therm]	*1,378*	*1,467*															1,466,918	2,957	2,717	13,629	***(all bldgs this zone)***	
2006 IECC																	600,594	468	4,847	0		
Total [MMBtu]	***398***	***6,696***	***167,316***																			
Elec [kWh]	*75,029*	*5,165*																				
Gas [therm]	*1,417*	*1,531*																				
30% Alternative																						
Total [MMBtu]	***288***	***5,198***	***249,739***																			
Elec [kWh]	*66,117*	*4,423*																				
Gas [therm]	*629*	*775*																				
NORFOLK																					**5**	**6.67%**
Total [MMBtu]				**-9**	**-186**	**-51**	**-432**	**-5,400**	**-9,668**	**114**	**2,290**	**1,297**	**5,598**	**77,023**	**137,902**	**-14,929**	**29,435**	**45**	**116**	**171**	**Annual Emmissions Savings**	
Elec [kWh]				612	12,240	44				8,000	160,000	577					19,302	37	34	171	***(per single bldg)***	
Gas [therm]				-114	-2,280	-95				872	17,440	720					10,133	8	82	0		
2003 IECC																						
Total [MMBtu]	***407***	***6,605***	***172,716***																			
Elec [kWh]	*72,652*	*5,086*															**147,177**	**225**	**579**	**856**	**Annual Emmissions Savings**	
Gas [therm]	*1,593*	*1,519*															96,511	186	171	856	***(all bldgs this zone)***	
2006 IECC																	50,666	39	409	0		
Total [MMBtu]	***417***	***6,656***	***167,316***																			
Elec [kWh]	*72,040*	*5,042*																				
Gas [therm]	*1,707*	*1,614*																				
30% Alternative																						
Total [MMBtu]	***293***	***5,308***	***249,739***																			
Elec [kWh]	*64,652*	*4,509*																				
Gas [therm]	*721*	*799*																				
CHADRON																					**1**	**1.33%**
Total [MMBtu]				**-8**	**-166**	**-49**	**-434**	**-5,400**	**-9,668**	**89**	**1,784**	**1,056**	**5,884**	**77,523**	**138,797**	**-15,357**	**22,766**	**36**	**91**	**139**	**Annual Emmissions Savings**	
Elec [kWh]				407	8,140	36				6,505	130,100	476					14,980	30	28	139	***(per single bldg)***	
Gas [therm]				-97	-1,940	-85				670	13,400	580					7,786	6	63	0		
2003 IECC																						
Total [MMBtu]	***366***	***6,051***	***172,216***																			
Elec [kWh]	*71,216*	*4,985*															**22,766**	**36**	**91**	**139**	**Annual Emmissions Savings**	
Gas [therm]	*1,231*	*1,066*															14,980	30	28	139	***(all bldgs this zone)***	
2006 IECC																	7,786	6	63	0		
Total [MMBtu]	***374***	***6,100***	***166,816***																			
Elec [kWh]	*70,809*	*4,949*																				
Gas [therm]	*1,328*	*1,151*																				
30% Alternative																						
Total [MMBtu]	***277***	***4,995***	***249,739***																			
Elec [kWh]	*64,711*	*4,509*																				
Gas [therm]	*561*	*486*																				
STATE-WIDE																					**75**	**100.00%**
Total [MMBtu]				**-249**	**-52,213**	**-3,823**	**-720**	**-50,754**	**-90,870**	**8,003**	**1,680,682**	**107,384**	**441,505**	**6,131,471**	**10,977,786**	**-1,193,933**	**2,237,455**	**3,686**	**8,234**	**14,624**	**Annual Emmissions Savings**	
Elec [kWh]				25,547	5,364,870	1,153				683,513	143,537,730	55,456					1,578,409	3,173	2,916	14,624	***(all bldgs statewide)***	
Gas [therm]				-3,358	-705,180	-4,976				56,711	11,909,310	51,928					659,045	513	5,319	0		

NOTES: (a) Building Components / Systems Affecting Energy Consumption ONLY.
(b) Assumed Annual Construction Starts by Region - Data as provided by the Nebraska Energy Office

Nebraska-specific Advanced Commercial Building Energy Code Study

Analysis Summary

LEO A DALY

SMALL RETAIL

Location	Energy		Cost	2003 IECC to 2006 IECC Comparison						2003 IECC to 30% Alternative Comparison											Construction Starts	
				Energy Consumption						Energy Consumption							Environmental Impact Emission Reductions					
	Annual Energy Consumption	Annual Energy Cost [$]	Capital Investment Cost (Note a) [$]	Annual Savings	Accumulated 20 YR Savings	First Year Energy Cost Savings [$]	Mortgage Cost-Energy Cost Savings (Year 1) [$]	Capital Investment Cost Δ [$]	20 Year Mortgage Cost Δ [$]	Annual Savings	Accumulated 20 YR Savings	First Year Energy Cost Savings [$]	Mortgage Costs-Energy Cost Savings (Year 1) [$]	Capital Investment Cost Δ [$]	20 Year Mortgage Cost Δ [$]	LCCA Net Present Worth Δ [$]	CO2 [lbs]	NOx [lbs]	SO2 [lbs]	Hg [mg]	(Note b) [#]	[%]
OMAHA																					**346**	**92.76%**
Total [MMBtu]				**28**	**558**	**362**	**-604**	**-2,700**	**-4,834**	**167**	**3,350**	**2,035**	**77**	**23,590**	**42,236**	**44,558**	**44,285**	**71**	**174**	**275**	**Annual Emmissions Savings**	
Elec [kWh]				3,400	68,000	200				12,837	256,740	842					29,561	60	55	275	***(per single bldg)***	
Gas [therm]				163	3,260	162				1,237	24,740	1,193					14,724	11	119	0		
2003 IECC																						
Total [MMBtu]	***510***	***7,385***	***79,190***																			
Elec [kWh]	*76,114*	*4,834*															**15,322,750**	**24,579**	**60,051**	**95,028**	**Annual Emmissions Savings**	
Gas [therm]	*2,504*	*2,551*															10,228,237	20,613	18,939	95,028	***(all bldgs this zone)***	
2006 IECC																	5,094,514	3,966	41,112	0		
Total [MMBtu]	***482***	***7,023***	***76,490***																			
Elec [kWh]	*72,714*	*4,634*																				
Gas [therm]	*2,341*	*2,389*																				
30% Alternative																						
Total [MMBtu]	***343***	***5,350***	***102,780***																			
Elec [kWh]	*63,277*	*3,992*																				
Gas [therm]	*1,267*	*1,358*																				
NORFOLK																					**22**	**5.90%**
Total [MMBtu]				**32**	**636**	**377**	**-619**	**-2,700**	**-4,834**	**196**	**3,924**	**2,088**	**248**	**26,090**	**46,712**	**41,961**	**46,994**	**202**	**68**	**272**	**Annual Emmissions Savings**	
Elec [kWh]				3,136	62,720	202				12,691	253,820	826					29,225	59	54	272	***(per single bldg)***	
Gas [therm]				211	4,220	175				1,529	30,580	1,262					17,769	143	14	0		
2003 IECC																						
Total [MMBtu]	***548***	***7,777***	***79,690***																			
Elec [kWh]	*73,359*	*5,119*															**1,033,867**	**4,451**	**1,495**	**5,974**	**Annual Emmissions Savings**	
Gas [therm]	*2,972*	*2,658*															642,953	1,296	1,191	5,974	***(all bldgs this zone)***	
2006 IECC																	390,913	3,155	304	0		
Total [MMBtu]	***516***	***7,400***	***76,990***																			
Elec [kWh]	*70,223*	*4,917*																				
Gas [therm]	*2,761*	*2,483*																				
30% Alternative																						
Total [MMBtu]	***351***	***5,689***	***105,780***																			
Elec [kWh]	*60,668*	*4,293*																				
Gas [therm]	*1,443*	*1,396*																				
CHADRON																					**5**	**1.34%**
Total [MMBtu]				**29**	**582**	**365**	**-607**	**-2,700**	**-4,834**	**170**	**3,408**	**1,949**	**387**	**26,090**	**46,712**	**25,480**	**43,046**	**68**	**173**	**261**	**Annual Emmissions Savings**	
Elec [kWh]				3,078	61,560	204				12,193	243,860	834					28,078	57	52	261	***(per single bldg)***	
Gas [therm]				186	3,720	161				1,288	25,760	1,115					14,968	12	121	0		
2003 IECC																						
Total [MMBtu]	***474***	***6,941***	***73,690***																			
Elec [kWh]	*70,223*	*4,912*															**215,232**	**341**	**864**	**1,304**	**Annual Emmissions Savings**	
Gas [therm]	*2,343*	*2,029*															140,392	283	260	1,304	***(all bldgs this zone)***	
2006 IECC																	74,840	58	604	0		
Total [MMBtu]	***445***	***6,576***	***70,990***																			
Elec [kWh]	*67,145*	*4,708*																				
Gas [therm]	*2,157*	*1,868*																				
30% Alternative																						
Total [MMBtu]	***303***	***4,992***	***99,780***																			
Elec [kWh]	*58,030*	*4,078*																				
Gas [therm]	*1,055*	*914*																				
STATE-WIDE																					**373**	**100.00%**
Total [MMBtu]				**10,499**	**2,204,746**	**135,397**	**-225,553**	**-1,007,100**	**-1,803,112**	**63,123**	**13,255,913**	**759,817**	**33,918**	**8,866,570**	**15,874,707**	**16,467,610**	**16,571,849**	**29,371**	**62,410**	**102,306**	**Annual Emmissions Savings**	
Elec [kWh]				1,260,782	264,764,220	74,664				4,781,769	1,004,171,490	313,674					11,011,582	22,192	20,389	102,306	***(all bldgs statewide)***	
Gas [therm]				61,970	13,013,700	60,733				468,080	98,296,800	446,143					5,560,267	7,179	42,021	0		

NOTES: (a) Building Components / Systems Affecting Energy Consumption ONLY.
(b) Assumed Annual Construction Starts by Region - Data as provided by the Nebraska Energy Office

Nebraska-specific Advanced Commercial Building Energy Code Study

Analysis Summary

LEO A DALY

RETAIL STRIP MALL

Location	Energy		Cost	2003 IECC to 2006 IECC Comparison						2003 IECC to 30% Alternative Comparison											
				Energy Consumption						Energy Consumption											
	Annual Energy Consumption	Annual Energy Cost	Capital Investment Cost (Note a)	Annual Savings	Accumulated 20 YR Savings	First Year Energy Cost Savings	Mortgage Cost-Energy Cost Savings (Year 1)	Capital Investment Cost Δ	20 Year Mortgage Cost Δ	Annual Savings	Accumulated 20 YR Savings	First Year Energy Cost Savings	Mortgage Costs-Energy Cost Savings (Year 1)	Capital Investment Cost Δ	20 Year Mortgage Cost Δ	LCCA Net Present Worth Δ	Environmental Impact Emission Reductions CO2	NOx	SO2	Hg	Construction Starts (Note b)
		[$]	[$]			[$]	[$]	[$]	[$]			[$]	[$]	[$]	[$]	[$]	[lbs]	[lbs]	[lbs]	[mg]	[#] [%]
OMAHA																					**149 93.13%**
Total [MMBtu]				**19**	**382**	**168**	**-258**	**-1,007**	**-1,803**	**692**	**13,844**	**15,636**	**-5,539**	**112,795**	**201,947**	**156,642**	**213,918**	**366**	**724**	**1,498**	**Annual Emmissions Savings**
Elec [kWh]				-234	-4,680	-18				70,018	1,400,360	11,376					161,239	325	299	1,498	***(per single bldg)***
Gas [therm]				199	3,980	186				4,533	90,660	4,260					52,679	41	425	0	
2003 IECC																					
Total [MMBtu]	***2,174***	***36,960***	***208,042***																		
Elec [kWh]	*331,272*	*26,998*															**31,873,787**	**54,539**	**107,836**	**223,207**	**Annual Emmissions Savings**
Gas [therm]	*10,438*	*9,962*															24,024,646	48,426	44,492	223,207	***(all bldgs this zone)***
2006 IECC																	7,849,141	6,113	63,344	0	
Total [MMBtu]	***2,155***	***36,792***	***207,035***																		
Elec [kWh]	*331,506*	*27,016*																			
Gas [therm]	*10,239*	*9,776*																			
30% Alternative																					
Total [MMBtu]	***1,482***	***21,324***	***320,837***																		
Elec [kWh]	*261,254*	*15,622*																			
Gas [therm]	*5,905*	*5,702*																			
NORFOLK																					**10 6.25%**
Total [MMBtu]				**24**	**476**	**186**	**-839**	**-7,290**	**-13,052**	**779**	**15,570**	**9,108**	**499**	**107,312**	**192,131**	**53,358**	**219,254**	**363**	**802**	**1,445**	**Annual Emmissions Savings**
Elec [kWh]				-146	-2,920	-15				67,556	1,351,120	4,583					155,570	314	288	1,445	***(per single bldg)***
Gas [therm]				243	4,860	201				5,480	109,600	4,525					63,684	50	514	0	
2003 IECC																					
Total [MMBtu]	***2,281***	***31,338***	***206,325***																		
Elec [kWh]	*316,618*	*21,220*															**2,192,537**	**3,632**	**8,021**	**14,454**	**Annual Emmissions Savings**
Gas [therm]	*12,007*	*10,118*															1,555,697	3,136	2,881	14,454	***(all bldgs this zone)***
2006 IECC																	636,841	496	5,139	0	
Total [MMBtu]	***2,257***	***31,152***	***199,035***																		
Elec [kWh]	*316,764*	*21,235*																			
Gas [therm]	*11,764*	*9,917*																			
30% Alternative																					
Total [MMBtu]	***1,502***	***22,230***	***313,637***																		
Elec [kWh]	*249,062*	*16,637*																			
Gas [therm]	*6,527*	*5,593*																			
CHADRON																					**1 0.63%**
Total [MMBtu]				**19**	**386**	**151**	**-804**	**-7,290**	**-13,052**	**636**	**12,730**	**7,734**	**1,389**	**101,912**	**182,463**	**35,208**	**187,833**	**316**	**661**	**1,278**	**Annual Emmissions Savings**
Elec [kWh]				-294	-5,880	-24				59,730	1,194,600	3,987					137,548	277	255	1,278	***(per single bldg)***
Gas [therm]				203	4,060	175				4,327	86,540	3,747					50,285	39	406	0	
2003 IECC																					
Total [MMBtu]	***1,975***	***28,233***	***197,325***																		
Elec [kWh]	*299,472*	*19,978*															**187,833**	**316**	**661**	**1,278**	**Annual Emmissions Savings**
Gas [therm]	*9,533*	*8,255*															137,548	277	255	1,278	***(all bldgs this zone)***
2006 IECC																	50,285	39	406	0	
Total [MMBtu]	***1,956***	***28,082***	***190,035***																		
Elec [kWh]	*299,766*	*20,002*																			
Gas [therm]	*9,330*	*8,080*																			
30% Alternative																					
Total [MMBtu]	***1,339***	***20,499***	***299,237***																		
Elec [kWh]	*239,742*	*15,991*																			
Gas [therm]	*5,206*	*4,508*																			
STATE-WIDE																					**160 100.00%**
Total [MMBtu]				**3,103**	**651,725**	**27,043**	**-47,653**	**-230,233**	**-412,209**	**111,560**	**23,427,499**	**2,428,578**	**-818,881**	**17,981,423**	**32,193,940**	**23,908,446**	**34,254,157**	**58,488**	**116,517**	**238,939**	**Annual Emmissions Savings**
Elec [kWh]				-36,620	-7,690,200	-2,856				11,167,972	2,345,274,120	1,744,841					25,717,890	51,839	47,628	238,939	***(all bldgs statewide)***
Gas [therm]				32,284	6,779,640	29,899				734,544	154,254,240	683,737					8,536,267	6,649	68,889	0	

NOTES: (a) Building Components / Systems Affecting Energy Consumption ONLY.
(b) Assumed Annual Construction Starts by Region - Data as provided by the Nebraska Energy Office

Nebraska-specific Advanced Commercial Building Energy Code Study

Analysis Summary

LEO A DALY

BIG BOX RETAIL

Location	Energy		Cost	2003 IECC to 2006 IECC Comparison						2003 IECC to 30% Alternative Comparison											Construction Starts	
				Energy Consumption						Energy Consumption							Environmental Impact Emission Reductions				(Note b)	
	Annual Energy Consumption	Annual Energy Cost [$]	Capital Investment Cost (Note a) [$]	Annual Savings	Accumulated 20 YR Savings	First Year Energy Cost Savings [$]	Mortgage Cost-Energy Cost Savings (Year 1) [$]	Capital Investment Cost Δ [$]	20 Year Mortgage Cost Δ [$]	Annual Savings	Accumulated 20 YR Savings	First Year Energy Cost Savings [$]	Mortgage Costs-Energy Cost Savings (Year 1) [$]	Capital Investment Cost Δ [$]	20 Year Mortgage Cost Δ [$]	LCCA Net Present Worth Δ [$]	CO2 [lbs]	NOx [lbs]	SO2 [lbs]	Hg [mg]	[#]	[%]
OMAHA																					**98**	**92.45%**
Total [MMBtu]				**256**	**5,120**	**2,534**	**-5,051**	**-28,120**	**-50,346**	**2,033**	**40,669**	**10,919**	**-28,104**	**-191,970**	**-343,703**	**303,163**	**-78,342**	**-510**	**1,731**	**-3,531**	**Annual Emmissions Savings**	
Elec [kWh]				9,027	180,540	466				-165,057	-3,301,140	-13,281					-380,097	-766	-704	-3,531	***(per single bldg)***	
Gas [therm]				2,252	45,040	2,068				25,966	519,320	24,200					301,756	256	2,435	0		
2003 IECC																						
Total [MMBtu]	***6,861***	***100,085***	***1,026,390***																			
Elec [kWh]	*1,116,806*	*71,545*															**-7,677,512**	**-49,963**	**169,671**	**-346,077**	**Annual Emmissions Savings**	
Gas [therm]	*30,504*	*28,540*															-37,249,553	-75,083	-68,986	-346,077	***(all bldgs this zone)***	
2006 IECC																	29,572,041	25,120	238,656	0		
Total [MMBtu]	***6,605***	***97,551***	***998,270***																			
Elec [kWh]	*1,107,779*	*71,079*																				
Gas [therm]	*28,252*	*26,472*																				
30% Alternative																						
Total [MMBtu]	***4,828***	***89,166***	***834,420***																			
Elec [kWh]	*1,281,863*	*84,826*																				
Gas [therm]	*4,538*	*4,340*																				
NORFOLK																					**7**	**6.60%**
Total [MMBtu]				**32**	**634**	**-1,844**	**-2,990**	**-54,000**	**-96,682**	**1,861**	**37,211**	**6,511**	**-25,856**	**-216,100**	**-386,905**	**336,866**	**-282,968**	**-943**	**1,466**	**-5,602**	**Annual Emmissions Savings**	
Elec [kWh]				2,579	51,580	-2,033				-261,859	-5,237,180	-16,229					-603,016	-1,215	-1,117	-5,602	***(per single bldg)***	
Gas [therm]				229	4,580	189				27,540	550,800	22,740					320,047	272	2,583	0		
2003 IECC																						
Total [MMBtu]	***6,870***	***98,074***	***1,073,520***																			
Elec [kWh]	*1,058,250*	*70,961*															**-1,980,778**	**-6,604**	**10,263**	**-39,217**	**Annual Emmissions Savings**	
Gas [therm]	*32,589*	*27,113*															-4,221,109	-8,508	-7,817	-39,217	***(all bldgs this zone)***	
2006 IECC																	2,240,331	1,904	18,080	0		
Total [MMBtu]	***6,838***	***99,918***	***1,019,520***																			
Elec [kWh]	*1,055,671*	*72,994*																				
Gas [therm]	*32,360*	*26,924*																				
30% Alternative																						
Total [MMBtu]	***5,009***	***91,563***	***857,420***																			
Elec [kWh]	*1,320,109*	*87,190*																				
Gas [therm]	*5,049*	*4,373*																				
CHADRON																					**1**	**0.94%**
Total [MMBtu]				**73**	**1,462**	**781**	**-5,615**	**-54,000**	**-96,682**	**1,595**	**31,897**	**6,705**	**-40,812**	**-381,000**	**-682,142**	**458,965**	**-238,032**	**-799**	**1,259**	**-4,752**	**Annual Emmissions Savings**	
Elec [kWh]				4,513	90,260	281				-222,089	-4,441,780	-13,668					-511,432	-1,031	-947	-4,752	***(per single bldg)***	
Gas [therm]				577	11,540	500				23,526	470,520	20,373					273,400	232	2,206	0		
2003 IECC																						
Total [MMBtu]	***6,122***	***90,636***	***1,184,420***																			
Elec [kWh]	*1,009,747*	*67,459*															**-238,032**	**-799**	**1,259**	**-4,752**	**Annual Emmissions Savings**	
Gas [therm]	*26,763*	*23,177*															-511,432	-1,031	-947	-4,752	***(all bldgs this zone)***	
2006 IECC																	273,400	232	2,206	0		
Total [MMBtu]	***6,048***	***89,855***	***1,130,420***																			
Elec [kWh]	*1,005,234*	*67,178*																				
Gas [therm]	*26,186*	*22,677*																				
30% Alternative																						
Total [MMBtu]	***4,527***	***83,931***	***803,420***																			
Elec [kWh]	*1,231,836*	*81,127*																				
Gas [therm]	*3,237*	*2,804*																				
STATE-WIDE																					**106**	**100.00%**
Total [MMBtu]				**25,383**	**5,330,432**	**236,205**	**-521,573**	**-3,187,760**	**-5,707,366**	**213,894**	**44,917,801**	**1,122,344**	**-2,976,013**	**-20,706,760**	**-37,073,383**	**32,527,001**	**-9,896,323**	**-57,367**	**181,193**	**-390,046**	**Annual Emmissions Savings**	
Elec [kWh]				907,212	190,514,520	31,718				-18,230,688	-3,828,444,480	-1,428,809					-41,982,094	-84,622	-77,750	-390,046	***(all bldgs statewide)***	
Gas [therm]				222,876	46,803,960	204,487				2,760,974	579,804,540	2,551,153					32,085,772	27,255	258,943	0		

NOTES: (a) Building Components / Systems Affecting Energy Consumption ONLY.
(b) Assumed Annual Construction Starts by Region - Data as provided by the Nebraska Energy Office

Nebraska-specific Advanced Commercial Building Energy Code Study

Analysis Summary

LEO A DALY

ELEMENTARY SCHOOL

Location	Energy		Cost	2003 IECC to 2006 IECC Comparison						2003 IECC to 30% Alternative Comparison												
				Energy Consumption						Energy Consumption							Environmental Impact Emission Reductions				Construction Starts	
	Annual Energy Consumption	Annual Energy Cost [$]	Capital Investment Cost (Note a) [$]	Annual Savings	Accumulated 20 YR Savings	First Year Energy Cost Savings [$]	Mortgage Cost-Energy Cost Savings (Year 1) [$]	Capital Investment Cost Δ [$]	20 Year Mortgage Cost Δ [$]	Annual Savings	Accumulated 20 YR Savings	First Year Energy Cost Savings [$]	Mortgage Costs-Energy Cost Savings (Year 1) [$]	Capital Investment Cost Δ [$]	20 Year Mortgage Cost Δ [$]	LCCA Net Present Worth Δ [$]	CO2 [lbs]	NOx [lbs]	SO2 [lbs]	Hg [mg]	(Note b) [#]	[%]
OMAHA																					**45**	**91.84%**
Total [MMBtu]				**75**	**1,508**	**1,584**	**-2,744**	**-15,085**	**-23,207**	**840**	**16,809**	**17,483**	**-3,429**	**182,715**	**281,089**	**2,112**	**481,487**	**948**	**1,003**	**4,308**	**Annual Emmissions Savings**	
Elec [kWh]				22,095	441,900	1,584				201,339	4,026,780	15,872					463,649	935	859	**4,308**	***(per single bldg)***	
Gas [therm]				0	0	0				1,535	30,700	1,611					17,839	14	144	**0**		
2003 IECC																						
Total [MMBtu]	***2,779***	***57,091***	***495,015***																			
Elec [kWh]	*769,399*	*55,480*															**21,666,919**	**42,681**	**45,118**	**193,844**	**Annual Emmissions Savings**	
Gas [therm]	*1,535*	*1,611*															20,864,187	42,055	38,640	193,844	***(all bldgs this zone)***	
2006 IECC																	802,733	626	6,479	0		
Total [MMBtu]	***2,703***	***55,507***	***479,930***																			
Elec [kWh]	*747,304*	*53,896*																				
Gas [therm]	*1,535*	*1,611*																				
30% Alternative																						
Total [MMBtu]	***1,938***	***39,608***	***677,730***																			
Elec [kWh]	*568,060*	*39,608*																				
Gas [therm]	*0*	*0*																				
NORFOLK																					**3**	**6.12%**
Total [MMBtu]				**-43**	**-858**	**-517**	**-1,560**	**-27,000**	**-41,537**	**873**	**17,459**	**13,349**	**-211**	**170,800**	**262,759**	**-53,498**	**500,907**	**987**	**1,042**	**4,483**	**Annual Emmissions Savings**	
Elec [kWh]				-12,577	-251,540	-517				209,545	4,190,900	11,839					482,546	973	894	**4,483**	***(per single bldg)***	
Gas [therm]				0	0	0				1,580	31,600	1,510					18,361	14	148	**0**		
2003 IECC																						
Total [MMBtu]	***2,792***	***48,090***	***473,930***																			
Elec [kWh]	*771,978*	*46,580*															**1,502,721**	**2,961**	**3,126**	**13,450**	**Annual Emmissions Savings**	
Gas [therm]	*1,580*	*1,510*															1,447,637	2,918	2,681	13,450	***(all bldgs this zone)***	
2006 IECC																	55,084	43	445	0		
Total [MMBtu]	***2,835***	***48,607***	***446,930***																			
Elec [kWh]	*784,555*	*47,097*																				
Gas [therm]	*1,580*	*1,510*																				
30% Alternative																						
Total [MMBtu]	***1,919***	***34,741***	***644,730***																			
Elec [kWh]	*562,433*	*34,741*																				
Gas [therm]	*0*	*0*																				
CHADRON																					**1**	**2.04%**
Total [MMBtu]				**-33**	**-666**	**-643**	**-1,434**	**-27,000**	**-41,537**	**586**	**11,714**	**8,370**	**4,768**	**170,800**	**262,759**	**-110,272**	**307,347**	**597**	**683**	**2,686**	**Annual Emmissions Savings**	
Elec [kWh]				-9,756	-195,120	-395				125,522	2,510,440	7,005					289,055	583	535	**2,686**	***(per single bldg)***	
Gas [therm]				0	0	-248				1,574	31,480	1,365					18,292	14	148	**0**		
2003 IECC																						
Total [MMBtu]	***2,285***	***39,124***	***454,930***																			
Elec [kWh]	*623,655*	*37,759*															**307,347**	**597**	**683**	**2,686**	**Annual Emmissions Savings**	
Gas [therm]	*1,574*	*1,365*															289,055	583	535	2,686	***(all bldgs this zone)***	
2006 IECC																	18,292	14	148	0		
Total [MMBtu]	***2,319***	***39,767***	***427,930***																			
Elec [kWh]	*633,411*	*38,154*																				
Gas [therm]	*1,574*	*1,613*																				
30% Alternative																						
Total [MMBtu]	***1,700***	***30,754***	***625,730***																			
Elec [kWh]	*498,133*	*30,754*																				
Gas [therm]	*0*	*0*																				
STATE-WIDE																					**49**	**100.00%**
Total [MMBtu]				**3,230**	**678,393**	**69,086**	**-129,609**	**-786,825**	**-1,210,452**	**41,026**	**8,615,391**	**835,152**	**-150,151**	**8,905,375**	**13,700,029**	**-175,726**	**23,476,987**	**46,239**	**48,927**	**209,979**	**Annual Emmissions Savings**	
Elec [kWh]				946,788	198,825,480	69,334				9,814,412	2,061,026,520	756,762					22,600,879	45,556	41,856	209,979	***(all bldgs statewide)***	
Gas [therm]				0	0	-248				75,389	15,831,690	78,390					876,109	683	7,071	0		

NOTES: (a) Building Components / Systems Affecting Energy Consumption ONLY.
(b) Assumed Annual Construction Starts by Region - Data as provided by the Nebraska Energy Office

Nebraska-specific Advanced Commercial Building Energy Code Study

Analysis Summary

LEO A DALY

SECONDARY SCHOOL

Location	Energy		Cost	2003 IECC to 2006 IECC Comparison						2003 IECC to 30% Alternative Comparison											
				Energy Consumption						Energy Consumption											
	Annual Energy Consumption	Annual Energy Cost	Capital Investment Cost (Note a)	Annual Savings	Accumulated 20 YR Savings	First Year Energy Cost Savings	Mortgage Cost-Energy Cost Savings (Year 1)	Capital Investment Cost Δ	20 Year Mortgage Cost Δ	Annual Savings	Accumulated 20 YR Savings	First Year Energy Cost Savings	Mortgage Costs-Energy Cost Savings (Year 1)	Capital Investment Cost Δ	20 Year Mortgage Cost Δ	LCCA Net Present Worth Δ	Environmental Impact Emission Reductions CO2	NOx	SO2	Hg	Construction Starts (Note b)
		[$]	[$]			[$]	[$]	[$]	[$]			[$]	[$]	[$]	[$]	[$]	[lbs]	[lbs]	[lbs]	[mg]	[#] [%]
OMAHA																					**22 88.00%**
Total [MMBtu]				**153**	**3,057**	**2,838**	**-4,708**	**-24,309**	**-37,397**	**1,271**	**25,417**	**21,975**	**-20,469**	**19,574**	**30,113**	**-670,001**	**684,807**	**1,336**	**1,492**	**6,028**	**Annual Emmissions Savings**
Elec [kWh]				44,765	895,300	2,838				281,758	5,635,160	18,944					648,840	1,308	1,202	6,028	***(per single bldg)***
Gas [therm]				1	20	0				3,095	61,900	3,031					35,968	28	290	0	
2003 IECC																					
Total [MMBtu]	***4,163***	***81,600***	***1,115,914***																		
Elec [kWh]	*1,129,525*	*78,569*															**15,065,756**	**29,389**	**32,822**	**132,621**	**Annual Emmissions Savings**
Gas [therm]	*3,095*	*3,031*															14,274,470	28,773	26,436	132,621	***(all bldgs this zone)***
2006 IECC																	791,286	617	6,386	0	
Total [MMBtu]	***4,011***	***78,762***	***1,091,605***																		
Elec [kWh]	*1,084,760*	*75,731*																			
Gas [therm]	*3,094*	*3,031*																			
30% Alternative																					
Total [MMBtu]	***2,893***	***59,625***	***1,135,488***																		
Elec [kWh]	*847,767*	*59,625*																			
Gas [therm]	*0*	*0*																			
NORFOLK																					**2 8.00%**
Total [MMBtu]				**21**	**417**	**482**	**-3,805**	**-43,200**	**-66,459**	**1,306**	**26,127**	**19,199**	**-19,839**	**-8,317**	**-12,794**	**-646,574**	**705,470**	**1,377**	**1,534**	**6,214**	**Annual Emmissions Savings**
Elec [kWh]				6,108	122,160	481				290,433	5,808,660	16,390					668,817	1,348	1,239	6,214	***(per single bldg)***
Gas [therm]				0	0	1				3,154	63,080	2,809					36,653	29	296	0	
2003 IECC																					
Total [MMBtu]	***4,170***	***72,104***	***1,059,305***																		
Elec [kWh]	*1,129,818*	*69,295*															**1,410,939**	**2,753**	**3,069**	**12,428**	**Annual Emmissions Savings**
Gas [therm]	*3,154*	*2,809*															1,337,633	2,696	2,477	12,428	***(all bldgs this zone)***
2006 IECC																	73,306	57	592	0	
Total [MMBtu]	***4,149***	***71,622***	***1,016,105***																		
Elec [kWh]	*1,123,710*	*68,814*																			
Gas [therm]	*3,154*	*2,808*																			
30% Alternative																					
Total [MMBtu]	***2,864***	***52,905***	***1,050,988***																		
Elec [kWh]	*839,385*	*52,905*																			
Gas [therm]	*0*	*0*																			
CHADRON																					**1 4.00%**
Total [MMBtu]				**13**	**263**	**332**	**-3,655**	**-43,200**	**-66,459**	**1,040**	**20,799**	**14,606**	**-10,838**	**48,984**	**75,356**	**-692,847**	**525,902**	**1,015**	**1,202**	**4,546**	**Annual Emmissions Savings**
Elec [kWh]				3,856	77,120	332				212,476	4,249,520	11,878					489,295	986	906	4,546	***(per single bldg)***
Gas [therm]				0	0	0				3,150	63,000	2,728					36,607	29	295	0	
2003 IECC																					
Total [MMBtu]	***3,705***	***64,152***	***1,035,805***																		
Elec [kWh]	*993,452*	*61,424*															**525,902**	**1,015**	**1,202**	**4,546**	**Annual Emmissions Savings**
Gas [therm]	*3,150*	*2,728*															489,295	986	906	4,546	***(all bldgs this zone)***
2006 IECC																	36,607	29	295	0	
Total [MMBtu]	***3,692***	***63,820***	***992,605***																		
Elec [kWh]	*989,596*	*61,092*																			
Gas [therm]	*3,150*	*2,728*																			
30% Alternative																					
Total [MMBtu]	***2,665***	***49,546***	***1,084,788***																		
Elec [kWh]	*780,976*	*49,546*																			
Gas [therm]	*0*	*0*																			
STATE-WIDE																					**25 100.00%**
Total [MMBtu]				**3,417**	**717,628**	**63,732**	**-114,838**	**-664,399**	**-1,022,111**	**31,612**	**6,638,429**	**536,454**	**-500,841**	**462,989**	**712,262**	**-16,726,017**	**17,002,597**	**33,158**	**37,092**	**149,594**	**Annual Emmissions Savings**
Elec [kWh]				1,000,902	210,189,420	63,730				6,992,018	1,468,323,780	461,426					16,101,398	32,455	29,819	149,594	***(all bldgs statewide)***
Gas [therm]				22	4,620	2				77,548	16,285,080	75,028					901,199	702	7,273	0	

NOTES: (a) Building Components / Systems Affecting Energy Consumption ONLY.
(b) Assumed Annual Construction Starts by Region - Data as provided by the Nebraska Energy Office

Nebraska-specific Advanced Commercial Building Energy Code Study

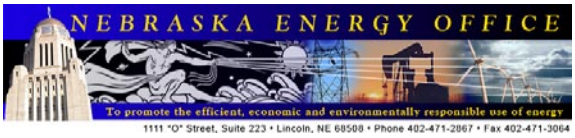
Analysis Summary

LEO A DALY

WAREHOUSE

Location	Energy		Cost	2003 IECC to 2006 IECC Comparison						2003 IECC to 30% Alternative Comparison											
				Energy Consumption						Energy Consumption											
	Annual Energy Consumption	Annual Energy Cost	Capital Investment Cost (Note a)	Annual Savings	Accumulated 20 YR Savings	First Year Energy Cost Savings	Mortgage Cost-Energy Cost Savings (Year 1)	Capital Investment Cost Δ	20 Year Mortgage Cost Δ	Annual Savings	Accumulated 20 YR Savings	First Year Energy Cost Savings	Mortgage Costs-Energy Cost Savings (Year 1)	Capital Investment Cost Δ	20 Year Mortgage Cost Δ	LCCA Net Present Worth Δ	Environmental Impact Emission Reductions				Construction Starts (Note b)	
		[$]	[$]			[$]	[$]	[$]	[$]			[$]	[$]	[$]	[$]	[$]	CO2 [lbs]	NOx [lbs]	SO2 [lbs]	Hg [mg]	[#]	[%]
OMAHA																					**49**	**90.74%**
Total [MMBtu]				**7**	**135**	**105**	**-1,178**	**-11,981**	**-21,451**	**427**	**8,532**	**4,408**	**13,285**	**197,639**	**353,853**	**-61,048**	**43,370**	**34**	**350**	**335**	**Annual Emmissions Savings**	
Elec [kWh]				1,310	26,200	83				15,650	313,000	899					43,370	34	350	**335**	***(per single bldg)***	
Gas [therm]				23	460	22				3,732	74,640	3,509					0	0	0	**0**		
2003 IECC																						
Total [MMBtu]	***1,417***	***20,688***	***200,341***																			
Elec [kWh]	*217,371*	*14,133*															**2,125,141**	**1,656**	**17,151**	**16,407**	**Annual Emmissions Savings**	
Gas [therm]	*6,757*	*6,555*															2,125,141	1,656	17,151	16,407	***(all bldgs this zone)***	
2006 IECC																	0	0	0	0		
Total [MMBtu]	***1,411***	***20,583***	***188,360***																			
Elec [kWh]	*216,061*	*14,050*																				
Gas [therm]	*6,734*	*6,533*																				
30% Alternative																						
Total [MMBtu]	***991***	***16,280***	***397,980***																			
Elec [kWh]	*201,721*	*13,234*																				
Gas [therm]	*3,025*	*3,046*																				
NORFOLK																					**4**	**7.41%**
Total [MMBtu]				**2**	**46**	**64**	**-2,384**	**-25,920**	**-46,407**	**491**	**9,830**	**4,632**	**11,813**	**183,700**	**328,896**	**-47,774**	**50,994**	**40**	**412**	**330**	**Annual Emmissions Savings**	
Elec [kWh]				1,084	21,680	76				15,445	308,900	1,009					50,994	40	412	**330**	***(per single bldg)***	
Gas [therm]				-14	-280	-12				4,388	87,760	3,623					0	0	0	**0**		
2003 IECC																						
Total [MMBtu]	***1,545***	***21,139***	***214,280***																			
Elec [kWh]	*217,497*	*14,309*															**203,975**	**159**	**1,646**	**1,322**	**Annual Emmissions Savings**	
Gas [therm]	*8,025*	*6,830*															203,975	159	1,646	1,322	***(all bldgs this zone)***	
2006 IECC																	0	0	0	0		
Total [MMBtu]	***1,542***	***21,075***	***188,360***																			
Elec [kWh]	*216,413*	*14,233*																				
Gas [therm]	*8,039*	*6,842*																				
30% Alternative																						
Total [MMBtu]	***1,053***	***16,507***	***397,980***																			
Elec [kWh]	*202,052*	*13,300*																				
Gas [therm]	*3,637*	*3,207*																				
CHADRON																					**1**	**1.85%**
Total [MMBtu]				**2**	**36**	**64**	**-2,384**	**-25,920**	**-46,407**	**410**	**8,196**	**4,084**	**12,361**	**183,700**	**328,896**	**-57,209**	**41,662**	**32**	**336**	**322**	**Annual Emmissions Savings**	
Elec [kWh]				1,201	24,020	85				15,035	300,700	980					41,662	32	336	**322**	***(per single bldg)***	
Gas [therm]				-23	-460	-21				3,585	71,700	3,104					0	0	0	**0**		
2003 IECC																						
Total [MMBtu]	***1,382***	***19,823***	***214,280***																			
Elec [kWh]	*216,764*	*14,264*															**41,662**	**32**	**336**	**322**	**Annual Emmissions Savings**	
Gas [therm]	*6,420*	*5,559*															41,662	32	336	322	***(all bldgs this zone)***	
2006 IECC																	0	0	0	0		
Total [MMBtu]	***1,380***	***19,759***	***188,360***																			
Elec [kWh]	*215,563*	*14,179*																				
Gas [therm]	*6,443*	*5,580*																				
30% Alternative																						
Total [MMBtu]	***972***	***15,739***	***397,980***																			
Elec [kWh]	*201,729*	*13,284*																				
Gas [therm]	*2,835*	*2,455*																				
STATE-WIDE																					**54**	**100.00%**
Total [MMBtu]				**343**	**71,969**	**5,465**	**-69,621**	**-716,669**	**-1,283,124**	**23,279**	**4,888,608**	**238,604**	**710,560**	**10,602,811**	**18,983,273**	**-3,239,657**	**2,370,778**	**1,847**	**19,133**	**18,050**	**Annual Emmissions Savings**	
Elec [kWh]				69,727	14,642,670	4,456				843,665	177,169,650	49,067					2,370,778	1,847	19,133	18,050	***(all bldgs statewide)***	
Gas [therm]				1,048	220,080	1,009				204,005	42,841,050	189,537					0	0	0	0		

NOTES: (a) Building Components / Systems Affecting Energy Consumption ONLY.
(b) Assumed Annual Construction Starts by Region - Data as provided by the Nebraska Energy Office



13 November 2009

PURPOSE

The purpose of this study is to quantify the potential economic, energy, and environmental benefits to the State of Nebraska related to adopting a Statewide Advanced Energy Code. This study demonstrates the promulgation of a Nebraska Specific Advanced Energy Code could dramatically reduce energy consumption attributable to new commercial buildings constructed within the state. Coupled with reduced energy consumption, an Advanced Energy Code offers the potential to reduce carbon emissions and other environmental pollutants attributable to the generation of energy utilized in most commercial buildings. Whether produced at a remote source or at the building site, a significant portion of commercial building energy consumption is associated with heating, ventilation, air-conditioning, and lighting power.

BACKGROUND

This documentation submittal is in accordance with the Scope of Work (SOW) for the Nebraska-specific Advanced Commercial Building Energy Code Study (NABEC) dated 10/01/2008 as issued under RFP No. 2780Z1 by the State of Nebraska – Department of Administrative Services (AS) Materiel Division in support of the Nebraska Energy Office (NEO). The Omaha, Nebraska corporate headquarters office of LEO A DALY - Planning Architecture Engineering Interiors, under Service Contract No. 38617 04 dated 04/14/2009 has prepared this project progress documentation including all underlying engineering analysis related thereto with exceptions as noted.

KEY PROJECT TEAM MEMBERS

Pete Davis – Weatherization Division Chief, Nebraska Energy Office Project Manager – (402) 471-3347
Lynn K. Chamberlin, , Nebraska Energy Office, Building Program Specialist – (402) 471-3358
Bruce Hauschild, P.E., Nebraska Energy Office Energy Technical Advisor – (402) 471-3351
Michael J. Brady, P.E., LEO A DALY, Mechanical Engineer – (402) 390-4260
Alexander B. Skillman, EIT, LEO A DALY – Mechanical Engineer – (402) 390-4360
Matthew D. Martz, EIT, LEO A DALY – Mechanical Engineer – (402) 390-4297
Nick R. Decker, EIT, LEO A DALY – Mechanical Engineer – (402) 390-4418
Shane M. Cherney, EIT, LEO A DALY – Mechanical Engineer – (402) 390-4236
Daniel J. Dellovechio, P.E., Vice President Mechanical Engineering, LEO A DALY, Project Manager – (402) 390-4463

SCOPE OF WORK

The engineering efforts required for this technical study consisted of: preparing whole building energy models of ten representative (prototypical) commercial buildings across three Nebraska climate zones; achieving 30- percent energy reduction when compared to comparable ASHRAE Standard 90.1-2004

Appendix G baseline compliant models; estimating capital costs for systems affecting energy consumption for baseline models conforming to the prescriptive requirements of the 2003 IECC and the proposed models; estimating operating, maintenance, and replacement costs over the 20-year study life for systems affecting energy consumption, and combining data into life cycle cost analyses to determine the economic impact of energy saving measures.

The engineering efforts required for this 100-Percent final submittal, per this technical study's project Scope of Work (SOW), include documentation related to life cycle cost analyses (LCCA) for study's ten (10) prototypical commercial building models located within the three Nebraska statewide climate zones (as defined under the current state energy code - IECC 2003) compared to comparable building models employing advanced energy-saving strategies capable of achieving a nominal 30-Percent energy savings improvement over ASHRAE Standard 90.1-2004. The requisite energy models were provided as part of the earlier (35% and 65%) project study milestone submittals. This submittal augments the earlier efforts with the inclusion of the related LCCA documentation, including analysis summary spreadsheets that portray resultant model statistics for energy type consumption, economic, and atmospheric pollution characteristics. If desired, please refer to the report Appendices to view a copy of the complete project SOW.

Typical Building Definitions

Whole building energy analyses of the ten (10) prototypical commercial building models were completed using the building descriptions detailed in the project SOW. A brief description of each building type modeled in this study follows:

a) Large Office Building – 38% WWR - (60,000 GSF; 3-stories; 100x200-feet; 38-feet high)
b) Large Office Building – 18% WWR - (with other model characteristics same as Large Office Building – 38% WWR)
c) Small Office Building – 38% WWR - (10,000 GSF; 1-story; 75x133-feet; 14-feet high)
d) Small Office Building – 18% WWR - (with other model characteristics same as Small Office Building – 38% WWR)
e) Small Retail Building - 8% WWR - (5,000 GSF; 1-story; 40x125-feet; 14-feet high)
f) Retail Strip Mall (13,500 GSF; 6-bays including restaurant, auto supply store, medical supply store & three retail shops; 1 story; 75 x 180-feet; 14-feet high).
g) Large Big Box Retail Building - 2% WWR (100,000 GSF; 1-story; 250 x 400-feet; 20-feet high) Includes 6,000 SF offices and 14,000 SF storage.
h) Elementary Education Building – 18% WWR (50,000 GSF; 1-story; 150 x 333.25-feet; 14-feet high). Includes 20% Gym/Multi-Purpose/Cafeteria and 10% Media Center/Office area.
i) Secondary Education Building – 18% WWR (80,000 GSF; 1-story; U-Shaped @ 116.67 x 300-feet overall; 14-feet high). Includes 20% Gym/Lockers/Cafeteria and 10% Library/Media Center/Offices area.
j) Warehouse - 0% WWR (48,000 GSF; 1-story; 200 x 240-feet; 18-feet high). Includes 400 SF Office/Support area.

Advanced Energy Design Guides

As was determined during various project progress meetings and teleconferences, although the study's SOW included requirements to model the Elementary Education Building, Secondary Education Building, and the Warehouse Building under the 30% better than ASHRAE Std. 90.1-2004 scenarios in concert with the ASHRAE Advanced Energy Guidelines (AEDGs) for those building types, it was discovered (during the 35% project phase) that employing the AEDGs, originally developed/based upon the 1999 edition of ASHRAE Std. 90.1, would result in energy models roughly 30-Percent better than the prescriptive parameters of ASHRAE Std. 90.1-1999, and not the 2004 edition (which is more stringent). Thus study models employing the AEDGs were not pursued.

COMcheck Compliance

The study SOW includes a requirement for analyses of building envelope and lighting systems for the Retail Strip Mall and Large Big Box Retail Building under the 30%-BTA energy models using the U.S. Department of Energy's Building Energy Code Compliance (COMcheck) software program. LEO A DALY earlier confirmed (during the 35% project phase) with representatives of DOE's Pacific Northwest National Laboratory (PNNL), Mr. Mark Halverson, Senior Research Engineer of DOE's Energy and Environment Directorate, and Ms. Pamela C. Cole, that COMcheck software, in its current genesis, is incapable of indicating an overall (aggregated) 30-Percent energy improvement for building envelope, lighting and HVAC systems, but rather only component energy percentage improvements over prescriptive code requirements for building envelope and lighting systems, and a pass/fail assessment of HVAC systems. Given this information, NEO concurred with LEO A DALY during the 35% project phase that COMcheck analyses of these parameters would not result in useful information relevant to the 30%-BTA models, and as such, were not pursued further.

ANALYSIS METHODOLOGY

The final economic, energy, and environmental results of this study required a long line of steps to be completed. The following sections describe the general methodology, with specific model notes as necessary.

Zone Definition and Weather

The first step in the analysis of this study was to create the baseline models pursuant to the requirements set forth in ASHRAE Standard 90.1-2004. Under the requirements of the 2006 IECC and ASHRAE Standard 90.1-2004, the entire state of Nebraska is contained in climate zone 5A. The three cities representing Nebraska climate zones as described under the 2003 International Energy Conservation Code (IECC), include Omaha (zone 13b), Norfolk (zone 14b), and Chadron (zone 15). Table 1 shows the study cities and their respective climate zones.

Representative City	2003 IECC Climate Zone	2006 IECC Climate Zone	ASHRAE 90.1-2004 Climate Zone
Chadron	15	5A	5A
Norfolk	14b	5A	5A
Omaha	13b	5A	5A

Table 1 - Nebraska Climate Zones

Completing the whole building energy simulations required the use of hourly weather data files. In this case, typical meteorological year (TMY2) data was obtained from the U.S. National Renewable Energy Laboratory (NREL). The TMY2 weather files are based upon actual weather data collected between 1961 and 1990 and are intended to represent typical hourly weather patterns for a given location.

Prescriptive Code Requirements

The codes and standards used in this study each contain unique requirements for minimum prescriptive compliance in the areas of envelope, lighting power, and HVAC system efficiency. These minimum requirements varied depending upon the buildings climate zone and window to wall ratio. The baseline models employed the values listed in Table 2, Table 3, and Table 4 as required by location.

Component	2003 IECC (15)		2006 IECC (5A)		ASHRAE 90.1-2004 (5A)	
	WWR	Minimum	WWR	Minimum	WWR	Minimum
Wall	0-10	R-13+3 c.i.	All	R-13+3.8 c.i.	All	R-13+3.8 c.i.
	10.1-25	R-13+3 c.i.	-	-	-	-
	25.1-40	R-13+3 c.i.	-	-	-	-
Roof	0-10	R-20 c.i.	All	R-20 c.i.	All	R-15
	10.1-25	R-24 c.i.	-	-	-	-
	25.1-40	R-24 c.i.	-	-	-	-
Window	0-10	U-0.7 SHGC-any	0-40	U-0.55 SHGC-0.40	0-10	U-0.57 SHGC-0.49
	10.1-25	U-0.5 SHGC-0.50	-	-	10.1-40	U-0.57 SHGC-0.39
	25.1-40	U-0.5 SHGC-0.40	-	-	-	-

Table 2 - Chadron Zone Prescriptive Requirements

Component	2003 IECC (14b)		2006 IECC (5A)		ASHRAE 90.1-2004 (5A)	
	WWR	Minimum	WWR	Minimum	WWR	Minimum
Wall	0-10	R-13+3 c.i.	All	R-13+3.8 c.i.	All	R-13+3.8 c.i.
	10.1-25	R-13+3 c.i.	-	-	-	-
	25.1-40	R-13+7 c.i.	-	-	-	-
Roof	0-10	R-20 c.i.	All	R-20 c.i.	All	R-15
	10.1-25	R-20 c.i.	-	-	-	-
	25.1-40	R-24 c.i.	-	-	-	-
Window	0-10	U-0.7 SHGC-any	0-40		0-10	U-0.57 SHGC-0.49
	10.1-25	U-0.5 SHGC-0.50	-	-	10.1-40	U-0.57 SHGC-0.39
	25.1-40	U-0.5 SHGC-0.40	-	-	-	-

Table 3 - Norfolk Zone Prescriptive Requirements

Component	2003 IECC (13b)		2006 IECC (5A)		ASHRAE 90.1-2004 (5A)	
	WWR	Minimum	WWR	Minimum	WWR	Minimum
Wall	0-10	R-13	All	R-13+3.8 c.i.	All	R-13+3.8 c.i.
	10.1-25	R-13	-	-	-	-
	25.1-40	R-13	-	-	-	-
Roof	0-10	R-19 c.i.	All	R-20 c.i.	All	R-15
	10.1-25	R-20 c.i.	-	-	-	-
	25.1-40	R-24 c.i.	-	-	-	-
Window	0-10	U-any SHGC-any	0-40		0-10	U-0.57 SHGC-0.49
	10.1-25	U-0.5 SHGC-0.50	-	-	10.1-40	U-0.57 SHGC-0.39
	25.1-40	U-0.5 SHGC-0.40	-	-	-	-

Table 4 - Omaha Zone Prescriptive Requirements

ASHRAE Standard 90.1-2004

Energy models prepared for this study, as related to the 30-Percent better than the 2006 IECC analyses (aka: energy-improved models), employed whole-building modeling criteria as defined in ASHRAE Standard 90.1-2004 (Appendix G). In concurrence with NEO, Appendix G of the standard was employed (without amendments) in the energy models, as it provides guidance on how to prepare comparative analyses of proposed whole-building building energy models that would substantially exceed the minimum basic energy requirements of an ASHRAE Standard 90.1 (baseline) compliant building. The 2006 IECC (Section 501.1) provides a means for code-compliance through whole building computer-based analysis using ASHRAE Standard 90.1-2004 as an acceptable compliance path strategy. Furthermore, prototypical internal building load schedules relating to personnel occupancy, artificial lighting, emergency lighting, receptacle (plug loads), HVAC system, and service (domestic) hot water systems, as listed under the standard's User's Manual (2004 Edition) were employed "as is".

Generally, thermal zoning for each building model followed ASHRAE Standard 90.1-2004 Appendix G methodology for defining models without designed HVAC zones. Perimeter spaces with depths of 15-feet and containing only one exterior orientation were defined as separate thermal blocks. Additionally, interior spaces were assigned as one thermal block, unless otherwise required by the building description. In the case of the more detailed elementary and secondary schools, a generic floor plan was developed to assist in the zoning process.

Fenestration and Solar Control

Based on a given model's particular WWR glazing requirement, glass areas are uniformly distributed along all four exposed perimeters (Retail Strip Mall being an exception). Unless noted otherwise, glazing units for the proposed model building cases employ low-e insulating glass units having a 64-Percent visible light transmittance (similar to PPG-Solarban 70XL (2) Starphire glass) fitted in thermally-broken aluminum frames. To compensate for frame effects, the glazing values input into the e-QUEST software models were first adjusted using the U.S. Department of Energy - Lawrence Berkeley National

Laboratory's WINDOW (Version 5.2.17a) software. This allowed the use of fenestration assembly values, as opposed to center of glass values.

Unless noted specifically, study models for both baseline and proposed cases exclude exterior/interior shading devices such as overhangs, fixed or operable vertical (side) fins or interior daylight shelves.

Treatment of Non-regulated Power (Plug) Loads

Although analyzed for their overall contribution to electricity consumption, cooling loads, and heating loads in the prototypical building models, for the purposes of this study, presently non-regulated building user power (plug) loads have been discounted in regard to their contributions toward potential energy savings percentage improvement reductions. Non-regulated plug loads for commercial buildings can typically include appliances, computers, printers, copiers. Incidentally, such is also the case on all federally-funded (non-LEED ™ certifiable targeted) energy-improved building projects, as permitted by EPAct 2005 and shown in Equation 1.

$$\%\ \text{Improvement} = \frac{(\text{Baseline Energy Consumption} - \text{Proposed Energy Consumption})}{(\text{Baseline Energy Consumption} - \text{Receptacle Energy Consumption})}$$

Equation 1: Method of determining energy reduction compared to baseline

30-Percent Alternative Models

There are numerous combinations of potential energy conservative building component and engineering system improvements that may be developed and modeled to achieve a 30-Percent energy reduction improvement over current code-minimum baseline models. However, the approach utilized for this study focused on limiting the types of approaches to render a degree of consistency between the models to better facilitate comparisons.

Generally the following described upgrades were utilized. Exterior perimeter walls were limited to a common 6-inch stud cavity system to accommodate improved insulation requirements; either an R-30, or in a few instances, R-40 roof insulation was modeled over the baseline requirements; HVAC systems with the aforementioned improved SEER and AFUE ratings were modeled, and in several instances the additional application (where practical) of variable air volume (VAV) and variable speed drive (VFD) fan and pump motor control technology was applied, in addition to heat recovery/reclaim (wheel-based) equipment technology to pre-treat the code-required minimum outdoor (fresh) ventilation air requirements. Where ambient lighting upgrades were applied, T5 fluorescent lamp technology coupled with electronic ballasts were modeled against a baseline T8 lamp scenario.

Intentionally, none of the upgrades related to building envelope, windows, HVAC, or lighting features associated with the energy-improved alternative models included in this study are considered onerous or atypical to today's construction industry, but rather are those that are often routinely found today in energy-responsible construction (that exceeds the current code-mandated minimum requirements).

Approaches used on each model can be found in the individual model section summaries located in this report.

Commercial Utility Rate Schedules

For the purposes of developing related energy consumption and demand-related costs in the comparative software models, the energy utility provider rate schedules were utilized as shown in Table 5. The Chadron area natural gas provider, Source Gas, has multiple potential natural gas commodity suppliers and thus several potential commodity rates. Nebraska Municipal Power Pool (NMPP) Energy is one of several gas source suppliers to the Public Alliance for Community Energy (ACE). Source Gas is aligned with ACE. ACE rates employed: $0.86/therm - an average of historical data for the past year (June 2008 – May 2009) including $0.71/therm averaged consumption rate plus customer charges.

Utility	Omaha	Norfolk	Chadron
Electricity	OPPD Schedule 231	NPPD Schedule GS	NPPD Schedule GS
Natural Gas	MUD Schedule B	Black Hills Energy Schedule TSS	Source Gas provider average

Table 5 - Utility Rate Schedules by Location

Life Cycle Cost Analyses (LCCA)

The life cycle cost models developed for this study are based on a 20-year life, employing (BLCC Version 5.3-09) life cycle software as provided through the U.S. Department of Commerce's National Institute of Standards, exercising the Federal Energy Management Program (FEMP) model structure analysis approach option. In addition to BLCC LCCA report output documentation contained herein, are analysis summary spreadsheets for each building model comparison portraying select resultant model statistics for building energy consumption type (electricity and natural gas), economic (capital investment and mortgage/bond-related costs), and atmospheric pollution related characteristics.

The life cycle cost analyses (LCCA) employed a 20-year study life within the BLCC software program's Federal Energy Management Program (FEMP) model option. Default (BLCC program) U.S. Department of Energy (DOE) commercial energy sector discount and inflation rates based from the current year (2009) were utilized in the LCCA models as follows:

- Real Discount Rate (excluding general price inflation): 3.0%
- Nominal Discount Rate (including general price inflation): 4.2%
- Implied Long-term Average Rate of Energy Inflation: 1.2%

Capital Investment Cost Estimation

The initial capital investment cost for each baseline (2003 IECC) building model and its comparable alternative improved energy-savings model cost (employing a 30% Energy Savings better than ASHRAE Standard 90.1-2004) was estimated by a professional cost estimator. For this project, LEO A DALY retained as a sub-consultant, the cost estimation firm of Building Cost Consultants, Inc. of Plattsmouth, NE, to provide these services. The capital investment cost data may be found in the Appendices. Only capital investment costs impacting energy consumption as associated with various alternative energy-related building components, systems and equipment were estimated. These include exterior perimeter window glazing, walls, and roof envelopes, HVAC systems, and (as applicable) electric ambient lighting systems.

Preventative (Recurring) and Non-Recurring Maintenance Costs

Integral to the LCCA models are the costs associated with periodic component maintenance and system replacement that must be incurred as a result of the repairable economic lifetime of the component/system expiring within the study's given 20-year model life. For the purposes of this study, these costs are primarily associated with the various Heating, Ventilating and Air-Conditioning (HVAC) systems and their major components. Examples include packaged rooftop A/C units, DX split-system condensing units, furnaces, refrigeration compressors, boiler maintenance & chemical treatment, variable speed motor drives (VFDs), VAV terminal fans (on fan-powered boxes), as well as fluorescent lighting components such as lamps and ballasts. In response to the various systems modeled as part of this study, LEO A DALY developed the periodic maintenance and component replacement costs and their cycles for use in the LCCA analyses. These costs were sourced/adapted from a variety of resources including the 2008-2009 Whitestone Building Maintenance and Repair Cost Reference (13th Annual Edition as published by Whitestone Research); State of Iowa Department of Natural Resources – 2008 Life Cycle Cost Analysis Guidelines; and dialogs with various (Omaha area) HVAC equipment manufacturer representatives. Certain economic life cycle frequencies were developed and/or modified from the prior-referenced sources as deemed appropriate by LEO A DALY, based on our prior professional experience in the HVAC field.

Mortgage Loan/Bond Rates

For the purposes of evaluating the economic impacts of long-term (20 year) financing on the differing model capital investments as relate to energy-contributing building systems, components and equipment, commercial (non-school) building models presume a presumed 20-year fixed rate mortgage at 6.5%, and the elementary and secondary school building models presume a 20-year tax-exempt bond financing at 4.65%. The following caveats are nonetheless acknowledged.

- Commercial Construction Models (i.e. – non-schools): Commercial projects are subject to economic volatility as well as cyclical fluctuations in borrower credit criteria and bank loan underwriting standards, especially in the unpredictable post-Great Recession financial climate. It should also be noted, that while commercial loans may be amortized over a 20-year period, they generally require refinancing at a 'balloon' date, typically about 5 years after issue.
- School District Tax Exempt Bond Issues: financing terms on projects of governmental subdivisions depends on conditions in the overall economy, and the interest rate is a function of bond underwriting credit approvals and attractiveness to investors of the varying tax-exempt status of the bonds

Software Programs

DOE-2 eQUEST Energy Simulation Software

For the purposes of this engineering technical study, each prototypical building type has been modeled using the Quick Energy Simulation Tool (eQUEST) software v3.6 to develop the various energy performance/consumption models. eQUEST serves as the graphical user interface tool for creating detailed energy models in the DOE-2 building description language. Additionally, each software

simulation model includes representative present-day energy costs as derived from commercial building electricity and natural gas utility rate schedules of the utility providers for the various study regions within the State.

BLCC Life Cycle Cost Analyis Software

In order to accomplish the various LCCA analyses, LEO A DALY utilized the results of the foregoing described energy analyses as input for the SOW-required computer-based life cycle cost analysis modeling software, Building Life Cycle Cost (BLCC) Version 5.3-09, as issued through the U.S. Department of Commerce - National Institute of Standards and Technology (NIST) Office of Applied Economics – Building and Fire Research Laboratory.

ASSUMPTIONS & PARAMETERS

HVAC Systems

HVAC system cooling equipment associated with the energy-improved models employ EnergySTAR-compliant or better SEER ratings, generally as based on Tier 1 commercially-available off-the-shelf (COTS) equipment as locatable on the Consortium For Energy Efficiency's (CEE) High Efficiency Commercial Air Conditioning and Heat Pump Initiatives program website. Likewise, when commercially-available, the energy-improved models employ gas-fired heating equipment with condensing efficiencies of at least 90-Percent AFUE.

For HVAC equipment included under the 30%-BTA (energy-improved) models, commercial off-the-shelf (COTS) high-efficiency HVAC equipment energy efficiency ratings (EERs) tabulated (as of January 2009) under the Consortium For Energy Efficiency - Commercial Air Conditioning and Heat Pump Initiative (HECAC) website (http://www.cee1.org) was employed. The CEE Tier 1 rating category schedules, representing a larger equipment source availability pool and less-costly improved efficiency, were utilized in the study. Tabulated commercial equipment manufacturer products included on the CEE website are considered improved quality over basic code-minimum compliant equipment.

EPAct 2005 (Section 433.4 – Energy Efficiency Performance Standard)

The U.S. Energy Policy Act of 2005 (EPAct 2005) describes how the U.S. federal government defines a "30-Percent Energy Savings" that varies from ASHRAE Standard 90.1 in that it permits the exclusion of non-regulated plug loads (eg. – receptacle loads such as computers, printers, copiers, electronic devices, etc.) from a compliance analysis. With NEO concurrence that internal plug loads are non-regulated from a code standpoint, such could be discounted in the 30-Percent better than ASHRAE Std. 90.1-2004 (30%-BTA) energy-improved models prepared for the purposes of this study, at least for the purposes of showing an energy savings (as these loads would be consistent in both baseline and improved energy model simulations). Nonetheless, energy costs associated with prototypical plug loads have been included in all energy simulation models. It should be noted that the inclusion of plug loads in comparative energy model studies (from an energy consumption standpoint) results in the requirement for substantially increased energy reduction measures (and thus capital costs to implement same) in order to achieve target percentage energy savings.

RESULTS / CONCLUSIONS

Large Office 38-Percent WWR

The first model completed in the study exhibited decent economic returns in the effort to achieve energy reduction. The high window-to-wall ratio naturally led investigators to utilize an improved fenestration system, with significant savings from that feature alone.

The other improvements over the baseline model both concerned the HVAC system. First, the large office employed a packaged, direct expansion, variable air volume (VAV) system with variable speed drives (VSD) on the main ventilation fans. This feature allowed the fans, a major consumer of energy, to throttle back during periods of low building demand. To gain the remaining savings necessary to achieve the 30-percent energy reduction threshold, the HVAC systems were modeled following CEE Tier 1 efficiency criteria. In contrast, the baseline building was modeled with a constant air volume (CAV) HVAC system, per ASHRAE Std. 90.1-2004 Appendix G.

The large office models were used as test platforms to examine the effectiveness of other different energy savings strategies thru individual parametric energy sub-modeling tests, both independently and in combination with other energy savings measures. The results of this process can be seen in the "Alternative Energy Savings vs. ASHRAE 90.1-2004 Base Case" bar charts for each location, found in the study's archived data files available from NEO. Other building models used this concept in the development of a 30-percent energy-improved alternative model, but did not explicitly record each individual strategy as part of the earlier project phase (printed) submittal documentation.

Large Office 18-Percent WWR

This large office model description is identical to the previous large office model, except for the reduced amount of fenestration. Smaller window areas caused all the large office 18-percent WWR models to consume less energy than their 38-percent fenestration counterparts. However, the smaller glass area provided less opportunity to save energy by solely upgrading the window assembly. Therefore, the 18-percent model incorporated an upgraded roof with R-30 insulation in addition to the VAV system with VSD, CEE Tier 1 efficiencies, and the improved fenestration found with the 38-percent WWR model.

It should be noted that the 30-percent energy-improved alternative models for both the Omaha and Norfolk locations show the same total energy consumption on the analysis summary sheets. This is not an error, as the individual end-use consumption differs for each model and through data numerical rounding, happens to sum to the same total value.

Another item of note is the comparison of energy consumption between the 38-percent WWR and 18-percent WWR versions of the large office. The model with less fenestration consumed significantly less total energy than the model with the high glazing ratio. When compared with the 38-percent WWR model, the 18-percent WWR office required incorporating additional energy savings measures and a greater capital expenditure, as a percent increase over the 2003 IECC base case, to achieve the 30-percent reduction target.

Small Office 38-Percent WWR

The small office models retain the same basic rectangular footprint and space use as the large office models. However, the small office is only a single-story building, magnifying the importance of the wall and roof insulation relative to energy consumption. A high efficiency HVAC system with heat recovery, reduced lighting power consumption, significantly improved wall and roof insulation, and high performance glazing were all employed to achieve the 30-percent savings over the baseline model.

Despite achieving 30-percent energy consumption reductions and associated energy cost savings, none of the 38-percent WWR small office models were able to demonstrate a positive NPV over the study's 20- year life cycle.

Small Office 18-Percent WWR

The 18-percent WWR version of the small office was very similar to the 38-percent WWR model in both description and use of strategies to achieve a 30-percent energy consumption reduction. The sole difference was the model-basis glass type with slightly higher thermal conductivities and SHGC. The 18- percent WWR small office model resulted in poorer economic performance than the small office 38-percent WWR model.

As with the large office models, the overall energy consumption for the 18-percent WWR small office was less than the 38-percent WWR version. Unlike the large office models, the 38-percent WWR small office required a higher initial capital expenditure, as a percent increase over the 2003 IECC baseline, than the 18-percent WWR version. This limited comparison demonstrates the intuitive, that all else being equal, buildings with lower ratios of fenestration will consume less energy than otherwise identical buildings with high fenestration ratios. However, it should be noted that the difficulty in achieving a 30-percent energy savings does not necessarily correlate solely with glazing ratio, but rather also depends upon many facets of the building characteristics including: building proportions, internal volume to envelope ratio, building function, and the energy savings strategies employed.

Small Retail

The small retail model carried the least amount of floor area in this study and had a high ratio of building exterior envelope to internal volume. Much like the small office models, this high ratio placed emphasis on improving the wall and roof insulation in order to achieve 30-percent energy savings over the baseline. Improvements to the solar performance of this model's windows were also included, however this component contributed minimally to the overall savings because of the small window-to-wall ratio. In addition to the envelope upgrades, high efficiency HVAC systems were incorporated into the model.

The Small Retail model exhibited the best economic results in the study, with each model showing positive NPV, and a SIR value greater than 2.0. Key to this is that the system components and sizes used in the proposed and baseline models are very similar; causing the differences in maintenance and replacement costs to be small.

Retail Strip Mall

The retail strip mall model housed a variety of space uses within each bay, including general retail, supply stores, and a restaurant. The inclusion of a restaurant created a unique situation requiring the inclusion of a make-up air ventilation system to augment kitchen hood-related exhaust air.

Strategies incorporated into the 30-percent energy-improved alternative model included: improved wall rigid insulation, high performance glazing with external shading, and high efficiency HVAC equipment augmented with heat recovery. A large portion of the energy savings for this model was accomplished by reducing the heating energy associated with ventilation through the use of a heat recovery wheel.

Despite the challenges presented by this unique case, the Retail Strip Mall model achieved favorable economic returns, second only to the Small Retail building.

Big Box Retail

The large big box retail model contained the largest floor area of any building in this study. The baseline model reported a particularly high energy consumption to heat the building. Therefore, a focus of this model was recovering energy from air streams using a total energy wheel (ERV). Though the model showed increased fan energy, the combination of ERV, high efficiency HVAC cooling equipment, increased wall and roof insulation, insulated dock doors, and improved windows, resulted in energy savings very near the 30-percent level for the Omaha model.

This model had the unique economic result of an instant payback that was never negated during the 20-year study life. Its ASHRAE Standard 90.1-2004 baseline model was mandated to use a packaged DX VAV system with hot water reheat. The initial cost of this system resulted in a higher baseline capital cost than the alternative energy-improved building model. The resultant capital savings, coupled with the yearly energy cost savings, was enough to offset the increased OM&R and replacement costs for the proposed system.

Elementary School

While the elementary school baseline and proposed models' HVAC systems are both packaged single zone heat pumps, there is a significant first cost premium for the proposed system to incorporate energy recovery provisions associated with the zone heat pumps, in addition to a slight increase in roof insulation to achieve 30-percent energy savings. The elementary school model yielded a moderate payback period for two of the three Nebraska climate zones, falling just within the life cycle time-frame. The Chadron model did not realize as much energy cost savings from the addition of the energy recovery provisions due to the 2003 IECC requirements for a more insulated baseline envelope.

Secondary School

The secondary school exhibited the poorest economic performance of all study models. A number of elements contributed to this result including the building footprint, the SOW proposed HVAC system, OM&R costs The shape of the school necessitated the use of a relatively high number of thermal zones to satisfy the requirements of zoning set forth in ASHRAE Standard 90.1-2004.

In this case, the proposed building was modeled with rooftop air-to-air heat pumps, while the baseline building, per ASHRAE 90.1-2004, was modeled as a variable air volume system with parallel fan powered boxes. While the capital costs for the 30-percent (energy-improved) alternative building were slightly lower than the baseline system and the model saved annual energy costs, the 20-year life cycle showed significantly higher expenditures to maintain and replace components of the proposed heat pump system.

Although not modeled under the requirements for this study, it is believed through prior LEO A DALY client experience with school district projects within Nebraska and surrounding states, that were alternative HVAC systems employing vertical bore ground-source geothermal heat pumps deemed as a viable choice, such approaches often yield improved investment returns and payback periods well under 10 years.

Warehouse

The warehouse was described as a largely unoccupied storage area with a small occupied perimeter support office zone. After discussions with the Nebraska Energy Office, both the baseline and proposed warehouse models deviated from ASHRAE Standard 90.1-2004 by incorporating more-typical heating-only HVAC systems to serve the main warehouse storage areas, as opposed to systems also capable of cooling. It was determined that even though ASHRAE Standard 90.1-2004 requires that a cooling system be modeled, doing so would deviate from the intent of this study and not produce realistic and useful results relevant to the majority of warehouses typically constructed in Nebraska.

The majority of energy savings in this building model came from a reduction of the envelope load through increased wall and roof insulation. Like many of the other study buildings with gas-fired heating equipment, a 90% AFUE efficient furnace was also utilized in the proposed model. The cooling efficiency of the DX split system AC serving the office space was also improved, however the energy savings percentage from this latter feature was much smaller than for the other buildings in this study, again due to the office area being only a very small portion of the total building area that was cooled.

Statewide

Generally, the 30-percent energy-improved models performed best in the Omaha representative climate zone region, but showed less attractive economic paybacks in the Norfolk and Chadron regions. A likely cause of this result is the reduction of insulation requirements from the 2003 IECC to the 2006 IECC/ ASHRAE Std. 90.1-2004 minimum requirements. As shown in Table 6, approximately one-third of the models showed better energy performance under the 2003 IECC than the newer code.

Building Model Description	Climate Zone	Minimally Code Compliant Building Energy Consumption [MMbtu]		
		2003 IECC	*2006 IECC*	*% Reduction*
Large Office Building – 38% WWR	Omaha	2934	2932	0.1%
	Norfolk	2982	3001	-0.6%
	Chadron	2608	2710	-3.9%
Large Office Building – 18% WWR	Omaha	2624	2511	4.3%
	Norfolk	2558	2555	0.1%
	Chadron	2304	2311	-0.3%
Small Office Building – 38% WWR	Omaha	441	450	-2.0%
	Norfolk	448	469	-4.7%
	Chadron	413	423	-2.4%
Small Office Building – 18% WWR	Omaha	395	398	-0.8%
	Norfolk	407	417	-2.5%
	Chadron	366	374	-2.2%
Small Retail Building	Omaha	510	482	5.5%
	Norfolk	548	516	5.8%
	Chadron	474	445	6.1%
Retail Strip Mall	Omaha	2174	2155	0.9%
	Norfolk	2281	2257	1.1%
	Chadron	1975	1956	1.0%
Large Big Box Retail	Omaha	6861	6605	3.7%
	Norfolk	6870	6838	0.5%
	Chadron	6122	6048	1.2%
Elementary Education Building	Omaha	2779	2703	2.7%
	Norfolk	2792	2835	-1.5%
	Chadron	2285	2319	-1.5%
Secondary Education Building	Omaha	4163	4011	3.7%
	Norfolk	4170	4149	0.5%
	Chadron	3705	3692	0.4%
Warehouse	Omaha	1417	1411	0.4%
	Norfolk	1545	1542	0.2%
	Chadron	1382	1380	0.1%

Table 6 - Comparative Performance of Minimally Code Compliant Buildings under 2003 IECC and 2006 IECC

Selected summary data from the (DOE-2 eQUEST) energy software models, and various salient economic and atmospheric emission statistics for each building model, has been consolidated in the Analysis Summary spreadsheets which may be found under the Executive Summary section of this report.

Economic Impacts

In general, the results of the study's LCCA economic analyses appear to mixed, with certain building models reflecting positive net present values and varying accompanying payback periods in favor of the

30-Percent energy improved alternative models, whereas other building models do not reflect a beneficial economic net present worth or payback, in spite of often appreciable annual energy cost savings, and in some instances, lower initial capital outlays related to the 30-Percent energy-improved alternative-related investment costs. It appears that in most cases whereby no payback is achieved with the 30-Percent energy-improved alternative models, the primary reason is believed to be attributable to the magnitude of the periodic non-recurring system and/or major component replacement costs primarily attributable to HVAC-related equipment, as such must occur within the study's 20-year model life due to the inherent limits on maintainable life.

An abbreviated summary of the life cycle cost analyses results follows:

Building Model Description	Climate Zone	Payback (Yr)		SIR	AIRR [%]
		Simple	*Discounted*		
Large Office Building – 38% WWR	Omaha	Yes (14)	Yes (16)	1.83	6.17
	Norfolk	Yes (13)	Yes (16)	2.12	6.94
	Chadron	Yes (13)	Yes (15)	2.19	7.12
Large Office Building – 18% WWR	Omaha	Yes (16)	Yes (16)	1.41	4.78
	Norfolk	Yes (16)	Yes (18)	1.27	4.22
	Chadron	Yes (16)	Yes (20)	1.16	3.78
Small Office Building – 38% WWR	Omaha	Yes (20)	No	0.94	2.69
	Norfolk	Yes (20)	No	0.87	2.30
	Chadron	Yes (20)	No	0.99	2.95
Small Office Building – 18% WWR	Omaha	Yes (20)	No	0.72	1.29
	Norfolk	Yes (20)	No	0.71	1.27
	Chadron	Yes (20)	No	0.70	1.18
Small Retail Building	Omaha	Yes (8)	Yes(9)	2.91	8.64
	Norfolk	Yes (9)	Yes(10)	2.69	8.23
	Chadron	Yes (11)	Yes(11)	2.13	6.97
Retail Strip Mall	Omaha	Yes (8)	Yes(9)	2.59	8.02
	Norfolk	Yes (11)	Yes(16)	1.55	5.30
	Chadron	Yes (15)	Yes(16)	1.41	4.79
Large Big Box Retail	Omaha	Yes (Immediate)		N/A	N/A
	Norfolk	Yes (Immediate)		N/A	N/A
	Chadron	Yes (Immediate)		N/A	N/A
Elementary Education Building	Omaha	Yes (20)	Yes (20)	1.02	3.08
	Norfolk	Yes (20)	No	0.55	-0.02
	Chadron	No	No	0.08	-9.45
Secondary Education Building	Omaha	No	No	-	-
	Norfolk	No	No	-	-
	Chadron	No	No	-	-
Warehouse	Omaha	Yes (20)	No	0.56	0.04
	Norfolk	Yes (20)	No	0.63	0.63
	Chadron	Yes (20)	No	0.55	0.01

Table 7 - Life Cycle Cost Analyses Results Summary

Statewide Impacts / Annual Construction Starts

For the purposes of assessing overall Nebraska statewide impacts relevant to the adoption of an Advanced Energy Code, annual construction starts by building type was utilized as follows, based on data sourced by the Nebraska Energy Office.

Historical construction data shows an average of 1,249 commercial buildings are constructed in Nebraska annually, involving an average 25,528 square feet per building. Located throughout the state, these buildings may or may not be located within a local code jurisdiction that presently categorizes data regarding the construction building type. Additionally, there are no statewide reporting standards, uniform or otherwise, for local code jurisdictions that presently track building construction type data.

To determine the appropriate number of building types and locations for use in this study as related to addressing cumulative statewide economic and energy analysis statistics, the Nebraska Energy Office:

- collected building type data as compiled from four of the state's largest code jurisdictions – Omaha, Lincoln, Hastings and North Platte;
- analyzed the building type data collected from each of these jurisdictions and determined which of the *modeled* building types correlated to the building types indicated in the data;
- extrapolated by population the building type and number data from these communities to the state's 40 most-populous communities;
- determined the location and State Energy Code Building Climate Zone of each of the 40 communities;
- analyzed the collected building type data to determine the number of *not modeled* building types indicated on the community building data (eg. hospitals, laboratories, computer centers, churches, theatres, industrial buildings, hotels, other, etc…)
- extrapolated the *not modeled* building type and number data from the 40 communities;
- compared the actual and extrapolated building construction numbers to the available historic construction data and ascribed the additional historic construction numbers to the communities within Nebraska that are not among the 40 most-populous communities (10.4% or 130 commercial building structures);

Thus, given the above, for the purposes of this study, the cumulative statewide energy consumption, energy cost savings, incremental (delta) construction cost, and environmental emissions impacts for *modeled building types* constructed in Nebraska were then determined by utilizing building type model energy consumption results developed as part of the (DOE-2 eQUEST) energy modeling software analyses within the appropriate Nebraska State Energy Code Building Climate Zone, and applying this information to the model's corresponding (BLCC) LCCA analysis, in turn multiplied by the total number of buildings, per building type and climate zone, as listed in Table 8 below.

Note that building types not modeled in this study (i.e. hospitals, churches, theatres, industrial buildings, hotels) are not included in the annual construction start data. Furthermore, the ten building types represented by this study account for 903 of the 1249 historical commercial building construction starts.

Study-Modeled Commercial Building Annual Construction Starts

Building Type	Zone 13	Zone 14	Zone 15
Large Office Building 38% Window-to-Wall Ratio	10 + 1 = 11	1 + 0 = 1	0 + 0 = 0
Large Office Building 18% Window-to-Wall Ratio	10 + 1 = 11	1 + 0 = 1	1 + 0 = 1
Small Office Building 38% Window-to-Wall Ratio	31 + 3 = 34	2 + 0 = 2	0 + 0 = 0
Small Office Building 18% Window-to-Wall Ratio	62 + 7 = 69	4 + 1 = 5	1 + 0 = 1
Small Retail Building	310 + 36 = 346	21 + 2 = 22	4 + 1 = 5
Strip Mall	133 + 16 = 149	9 + 1 = 10	1 + 0 = 1
Big Box Retail	88 + 10 = 98	6 + 1 = 7	1 + 0 = 1
Elementary Schools	40 + 5 = 45	3 + 0 = 3	1 + 0 = 1
Secondary Schools	20 + 2 = 22	1 + 1 = 2	1 + 0 = 1
Warehouse	44 + 5 = 49	3 + 1 = 4	1 + 0 = 1

Table 8 - Annual Commercial Building Construction Starts by Zone

Note: The first number in each category indicates the estimated number of buildings, per modeled building type, constructed in the top 40 most-populous communities in Nebraska. The second number indicates the estimated number of buildings, per modeled building type, constructed outside of Nebraska's 40 most-populous communities.

As seen in Table 8, over 92-percent of construction starts are located in the greater Omaha-metro representative climate region, including the Lincoln-Omaha interstate corridor. Therefore, aggregate statewide impacts are heavily weighted towards the Omaha results.

Energy Impacts

This study clearly demonstrates that significant statewide reduction in future energy consumption could be achieved with the adoption of an Advanced Energy Code. An estimated accumulated 20-year energy savings of 108,738,240 MMBtu would result by the construction of 30-percent (energy-improved) alternative buildings when compared to their current code-minimum compliant counterparts. Table 9 below shows the 20-year cumulative energy savings for a single average building in each of the zones. Also shown is the statewide cumulative energy savings for all such commercial buildings potentially constructed and operated during the 20-year study period.

	Location Average Single Building			All Building Starts
	Omaha	*Norfolk*	*Chadron*	*Statewide Cumulative*
Cumulative Energy Savings [MMBtu]	11,443	12,207	9,761	108,738,240

Table 9 – 20-Year Cumulative Energy Consumption Savings

Environmental Impacts

A focus of the environmental impact assessment of this study was the reduction in carbon dioxide emissions, a detrimental atmospheric greenhouse gas, and other environmental pollutants created as by-products of energy production. Emissions are produced when fuels are combusted at off-site power plants producing electricity and by on-site heaters and furnaces producing heating energy. A reduction in the four major pollutants would be achieved by reducing commercial building demand for electricity and natural gas. Carbon dioxide, nitrogen oxides, sulfur dioxide, and mercury 20-year accumulated potential savings associated with the adoption of a statewide improved energy code are summarized in Table 10.

	Location Average Single Building			All Building Starts
Emission	*Omaha*	*Norfolk*	*Chadron*	*Statewide Cumulative*
Carbon Dioxide (CO_2) [lbs.]	2,074,725	1,745,949	2,115,678	19,479,889,792
Nitrogen Oxides (NO_x) [lbs.]	2,785	2,914	3,160	26,535,025
Sulfur Dioxide (SO_2) [lbs.]	11,114	10,566	9,629	104,866,423
Mercury (Hg) [mg]	8,804	4,216	11,661	81,087,531

Table 10 – 20-Year Cumulative Emissions Reductions

The Large Big Box Retail models demonstrated a counterintuitive increase in most emissions, despite a 30-percent reduction in energy consumption. This model achieved significant heating savings, drastically reducing its use of natural gas. However, requirements for increased fan power resulted in increased electricity consumption, driving up the overall associated carbon dioxide, nitrogen oxides, and mercury emissions compared to baseline model emissions.

Recommendations

The results of the study's energy modeling phases indicate that the differences in typical commercial building energy consumption between the 2003 IECC, Nebraska's currently-adopted energy code, and the 2006 IECC edition are generally marginal, and not significant enough to warrant adoption of the 2006 IECC code edition at this juncture. Of the 30 total building models evaluated (10 prototypes, each at the 3 climate zones):

- 21 models resulted in having either net negative energy savings (ie. – increased energy consumption) or up to a 1-Percent improvement at best
- 3 models yielded energy improvements between 1 and 3-Percent
- 6 models showed energy improvement gains of greater than 3-Percent.

Of this latter group, Small Retail Facilities (statewide) carried the best potential for improved energy reduction, followed by Large Offices-18% WWR, Large Big Box Retail facilities, Secondary Schools and Elementary Schools, all in the Omaha climate zone. The tabulated results are listed in Table 6, page 14.

Generally, the 2003 IECC models located in Chadron performed better than the 2006 IECC models in the same zone. This is likely due to the 2006 IECC simplification of the climate zone definitions from the 2003 IECC edition. Three climate zones, 13b (Omaha), 14b (Norfolk), and 15 (Chadron) existed under the 2003 IECC, each with a unique set of prescriptive requirements. Depending upon the building window to wall ratio, the 2003 IECC also had unique prescriptive requirements for roof and wall insulation as subsets of each climate zone requirements. In the 2006 IECC and ASHRAE Standard 90.1-2004, Nebraska was redefined as one homogenous climate zone.

Conversely, this study clearly demonstrates that the State of Nebraska would positively benefit from the promulgation of a Nebraska-specific Statewide Advanced Energy Code based on a requirement for all new commercial building construction to achieve a minimum 30-percent energy savings improvement over comparable ASHRAE Standard 90.1-2004 compliant baseline buildings. The demonstrated benefits include:

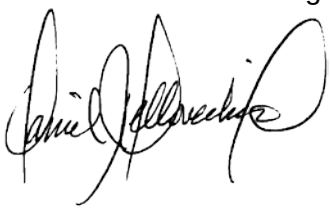
- Economic – The amortization of increased capital investment outlays associated with new building construction constructed in compliance with an Advanced Energy Code may generally be more than offset through commensurate reductions in operating energy cost outlays over the building's life. Using average 2009 R.S. MEANS Cost Guide unit construction costs for the modeled buildings, and given the study-presumed construction starts by building type per climate zone, the Nebraska statewide impact on additional capital construction costs employing an Advanced Energy Code slightly exceeds $43 Million annually on an estimated $3.36 Billion in statewide construction, or approximately a 1.28-Percent average increase in construction cost per building. Individual building models represent construction cost variations from as low as nearly a 1.4-Percent cost savings in construction for Large Big Box Retail facilities, to as high as 7.6-Percent added average construction cost for Retail Strip Malls to obtain the 30-Percent targeted energy savings over ASHRAE Standard 90.1-2004.

- Reduced Energy Consumption – The statewide annual energy savings (refer to Table 9, Page 18) are approximately $6.3 Million annually, which translates into tangential benefits for the public utility services being afforded opportunities to delay having to implement (build) larger or add additional generating capacity and the associated interstate energy transmission/delivery infrastructure to support new commercial building construction.

- Positive Environmental Impacts – The demonstrated reductions in such pollutants resulting from the implementation of an Advanced Energy Code for Nebraska can be related to other studies sponsored by various U.S. Federal Government Agencies such as the Environmental Protection Agency linking increases in the evaluated pollutants as hazardous to individual health, the earth's atmosphere (ozone layer degradation), and land, lakes and waterway resources. Reducing the additional amounts of these pollutants associated with new construction is beneficial to both the State of Nebraska and the world at-large. Initiatives favoring environmental pollution reduction are not only currently deemed 'politically correct' by an ever-growing percentage of the population, but are also deemed as good stewardship considerate of future generations by many others.

Additionally, although not modeled as part of this study, it can be readily deduced that by including requirements within such an Advanced Energy Code for applicability to substantial (area) additions and major renovations of existing commercial buildings, similar benefits would accrue to the State.

Respectfully Submitted,
LEO A DALY – Planning-Architecture-Engineering-Interiors



Daniel J. Dellovechio, PE, LEED® AP
Vice President, Mechanical Engineer
Project Manager

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
Envelope			
Wall Assembly	Same as baseline Gross Area: 21600 sf Net Area: 13392 sf		
Roof Assembly	Same as baseline Gross Area: 20000 sf		
Window Assembly	Solarban 70XL Starphire w/ thermally broken aluminum frame: U-0.42; SHGC-0.27; VLT-0.543 Gross Area: 8208 sf	Generic glazing: U-0.47; SHGC-0.39	
Interior Loads			
Lighting	Same as baseline		
Daylighting Controls	None	None	
HVAC Systems	Packaged VAV w/ Elec Reheat System fans with VSD	Packaged Single Zone Rooftop Units	
System 1	***EL1 Sys1 PVAVS (G)***	***EL1 Sys1 PSV (G.S1)***	
Cooling Cap [kBtu/h] (tons)	581.254 (48.4)	127.163 (10.6)	
Cooling Efficiency	10.7 EER	10.1 EER	
Heating Cap [kBtu/h]	0	229.225	
Heating Efficiency	N/A	80% AFUE	
Design Airflow [cfm]	15815	4327	
Fan Demand [kW]	15.545	3.223	
TSP [in. w.g.]	4.6	3.5	
Economizer	None	Yes, drybulb control	
Heat recovery	None	None	
Associated VAV Boxes	1@ 3393 cfm, 140.92 kBtu/h Heating 1@ 1604 cfm, 66.61 kBtu/h Heating 1@ 2056 cfm, 85.40 kBtu/h Heating 1@1646 cfm, 34.19 kBtu/h Heating 1@ 7116 cfm, 295.60 kBtu/h Heating	N/A	
System 2	***EL1 Sys1 PVAVS (M)***	***EL1 Sys1 PSV (G.E2)***	
Cooling Cap [kBtu/h] (tons)	631.169 (52.6)	62.961 (5.2)	

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
Cooling Efficiency	10.7 EER	12 SEER	
Heating Cap [kBtu/h]	0	113.331	
Heating Efficiency	N/A	80% AFUE	
Design Airflow [cfm]	17364	2047	
Fan Demand [kW]	17.031	1.574	
TSP [in. w.g.]	4.6	3.6	
Economizer	None	Yes, drybulb control	
Heat recovery	None	None	
Associated VAV Boxes	1@ 4127 cfm, 171.44 kBtu/h Heating 1@ 1904 cfm, 79.08 kBtu/h Heating 1@ 2390 cfm, 99.28 kBtu/h Heating 1@1827 cfm, 75.89 kBtu/h Heating 1@ 7116 cfm, 295.60 kBtu/h Heating	N/A	
System 3	***EL1 Sys1 PVAVS (T)***	***EL1 Sys1 PSV (G.N3)***	
Cooling Cap [kBtu/h] (tons)	681.777 (56.8)	81.742 (6.8)	
Cooling Efficiency	10.7 EER	10.1 EER	
Heating Cap [kBtu/h]	0	145.000	
Heating Efficiency	N/A	80% AFUE	
Design Airflow [cfm]	17364	2319	
Fan Demand [kW]	17.031	1.775	
TSP [in. w.g.]	4.6	2.46	
Economizer		Yes, drybulb control	
Heat recovery	None	None	
Associated VAV Boxes	1@ 4127 cfm, 171.44 kBtu/h Heating 1@ 1904 cfm, 79.08 kBtu/h Heating 1@ 2390 cfm, 99.28 kBtu/h Heating 1@1827 cfm, 75.89 kBtu/h Heating 1@ 7116 cfm, 295.60 kBtu/h Heating	N/A	
System 4		***EL1 Sys1 PSV (G.W4)***	
Cooling Cap [kBtu/h] (tons)		63.099 (5.3)	
Cooling Efficiency		12.0 SEER	
Heating Cap [kBtu/h]		114.010	

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
Heating Efficiency		80% AFUE	
Design Airflow [cfm]		2063	
Fan Demand [kW]		1.584	
TSP [in. w.g.]		3.6	
Economizer		Yes, drybulb control	
Heat recovery		None	
Associated VAV Boxes		N/A	
System 5		***EL1 Sys1 PSV (G.C5)***	
Cooling Cap [kBtu/h] (tons)		258.550 (21.5)	
Cooling Efficiency		9.3 EER	
Heating Cap [kBtu/h]		455.112	
Heating Efficiency		80% AFUE	
Design Airflow [cfm]		7116	
Fan Demand [kW]		5.197	
TSP [in. w.g.]		3.4	
Economizer		Yes, drybulb control	
Heat recovery		None	
Associated VAV Boxes		N/A	
System 6		***EL1 Sys1 PSV (M.S11)***	
Cooling Cap [kBtu/h] (tons)		158.344 (13.2)	
Cooling Efficiency		9.5 EER	
Heating Cap [kBtu/h]		285.785	
Heating Efficiency		80% AFUE	
Design Airflow [cfm]		5295	
Fan Demand [kW]		3.912	
TSP [in. w.g.]		3.5	
Economizer		Yes, drybulb control	
Heat recovery		None	
Associated VAV Boxes		N/A	
System 7		***EL1 Sys1 PSV (M.E12)***	
Cooling Cap [kBtu/h] (tons)		73.120 (6.1)	
Cooling Efficiency		10.1 EER	
Heating Cap [kBtu/h]		131.288	
Heating Efficiency		80% AFUE	
Design Airflow [cfm]		2426	
Fan Demand [kW]		1.851	
TSP [in. w.g.]		3.6	

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
Economizer		Yes, drybulb control	
Heat recovery		None	
Associated VAV Boxes		N/A	
System 8		***EL1 Sys1 PSV (M.N13)***	
Cooling Cap [kBtu/h] (tons)		90.936 (7.6)	
Cooling Efficiency		10.1 EER	
Heating Cap [kBtu/h]		164.480	
Heating Efficiency		80% AFUE	
Design Airflow [cfm]		2730	
Fan Demand [kW]		2.074	
TSP [in. w.g.]		3.6	
Economizer		Yes, drybulb control	
Heat recovery		None	
Associated VAV Boxes		N/A	
System 9		***EL1 Sys1 PSV (M.W14)***	
Cooling Cap [kBtu/h] (tons)		70.215 (5.9)	
Cooling Efficiency		10.1 EER	
Heating Cap [kBtu/h]		128.547	
Heating Efficiency		80% AFUE	
Design Airflow [cfm]		2370	
Fan Demand [kW]		1.807	
TSP [in. w.g.]		3.6	
Economizer		Yes, drybulb control	
Heat recovery		None	
Associated VAV Boxes		N/A	
System 10		***EL1 Sys1 PSV (M.C15)***	
Cooling Cap [kBtu/h] (tons)		258.550 (21.5)	
Cooling Efficiency		9.3 EER	
Heating Cap [kBtu/h]		455.112	
Heating Efficiency		80% AFUE	
Design Airflow [cfm]		7116	
Fan Demand [kW]		5.197	
TSP [in. w.g.]		3.4	
Economizer		Yes, drybulb control	
Heat recovery		None	
Associated VAV Boxes		N/A	

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
System 11		***EL1 Sys1 PSV (T.S21)***	
Cooling Cap [kBtu/h] (tons)		166.950 (13.9)	
Cooling Efficiency		9.5 EER	
Heating Cap [kBtu/h]		302.066	
Heating Efficiency		80% AFUE	
Design Airflow [cfm]		5295	
Fan Demand [kW]		3.912	
TSP [in. w.g.]		3.5	
Economizer		Yes, drybulb control	
Heat recovery		None	
Associated VAV Boxes		N/A	
System 12		***EL1 Sys1 PSV (T.E22)***	
Cooling Cap [kBtu/h] (tons)		77.122 (6.4)	
Cooling Efficiency		10.1 EER	
Heating Cap [kBtu/h]		138.785	
Heating Efficiency		80% AFUE	
Design Airflow [cfm]		2426	
Fan Demand [kW]		1.851	
TSP [in. w.g.]		3.6	
Economizer		Yes, drybulb control	
Heat recovery		None	
Associated VAV Boxes		N/A	
System 13		***EL1 Sys1 PSV (T.N23)***	
Cooling Cap [kBtu/h] (tons)		98.345 (8.2)	
Cooling Efficiency		10.1 EER	
Heating Cap [kBtu/h]		180.270	
Heating Efficiency		80% AFUE	
Design Airflow [cfm]		2730	
Fan Demand [kW]		2.074	
TSP [in. w.g.]		3.6	
Economizer		Yes, drybulb control	
Heat recovery		None	
Associated VAV Boxes		N/A	
System 14		***EL1 Sys1 PSV (T.W24)***	
Cooling Cap [kBtu/h] (tons)		73.745 (6.1)	
Cooling Efficiency		10.1 EER	

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
Heating Cap [kBtu/h]		136.037	
Heating Efficiency		80% AFUE	
Design Airflow [cfm]		2370	
Fan Demand [kW]		1.807	
TSP [in. w.g.]		3.6	
Economizer		Yes, drybulb control	
Heat recovery		None	
Associated VAV Boxes		N/A	
System 15		***EL1 Sys1 PSV (T.C25)***	
Cooling Cap [kBtu/h] (tons)		289.431 (24.1)	
Cooling Efficiency		9.3 EER	
Heating Cap [kBtu/h]		518.652	
Heating Efficiency		80% AFUE	
Design Airflow [cfm]		7116	
Fan Demand [kW]		5.197	
TSP [in. w.g.]		3.4	
Economizer		Yes, drybulb control	
Heat recovery		None	
Associated VAV Boxes		N/A	

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
Envelope			
Wall Assembly	Same as baseline Gross Area: 21600 sf Net Area: 13392 sf		
Roof Assembly	Same as baseline Gross Area: 20000 sf		
Window Assembly	Solarban 70XL Starphire w/ thermally broken aluminum frame: U-0.42; SHGC-0.27; VLT-0.543 Gross Area: 8208 sf	Generic glazing: U-0.47; SHGC-0.39	
Interior Loads			
Lighting	Same as baseline		
Daylighting Controls	None	None	
HVAC Systems	Packaged VAV w/ Elec Reheat System fans with VSD	Packaged Single Zone Rooftop Units	
System 1	***EL1 Sys1 PVAVS (G)***	***EL1 Sys1 PSV (G.S1)***	
Cooling Cap [kBtu/h] (tons)	581.254 (48.4)	125.124 (10.4)	
Cooling Efficiency	10.7 EER	10.1 EER	
Heating Cap [kBtu/h]	0	231.222	
Heating Efficiency	N/A	80% AFUE	
Design Airflow [cfm]	15815	4394	
Fan Demand [kW]	15.545	3.211	
TSP [in. w.g.]	4.6	3.5	
Economizer	None	Yes, drybulb control	
Heat recovery	None	None	
Associated VAV Boxes	1@ 3393 cfm, 140.92 kBtu/h Heating 1@ 1604 cfm, 66.61 kBtu/h Heating 1@ 2056 cfm, 85.40 kBtu/h Heating 1@1646 cfm, 34.19 kBtu/h Heating 1@ 7116 cfm, 295.60 kBtu/h Heating	N/A	
System 2	***EL1 Sys1 PVAVS (M)***	***EL1 Sys1 PSV (G.E2)***	
Cooling Cap [kBtu/h] (tons)	631.169 (52.6)	63.863 (5.3)	

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
Cooling Efficiency	10.7 EER	12 SEER	
Heating Cap [kBtu/h]	0	119.347	
Heating Efficiency	N/A	80% AFUE	
Design Airflow [cfm]	17364	2166	
Fan Demand [kW]	17.031	1.633	
TSP [in. w.g.]	4.6	3.6	
Economizer	None	Yes, drybulb control	
Heat recovery	None	None	
Associated VAV Boxes	1@ 4127 cfm, 171.44 kBtu/h Heating 1@ 1904 cfm, 79.08 kBtu/h Heating 1@ 2390 cfm, 99.28 kBtu/h Heating 1@1827 cfm, 75.89 kBtu/h Heating 1@ 7116 cfm, 295.60 kBtu/h Heating	N/A	
System 3	***EL1 Sys1 PVAVS (T)***	***EL1 Sys1 PSV (G.N3)***	
Cooling Cap [kBtu/h] (tons)	681.777 (56.8)	76.981 (6.4)	
Cooling Efficiency	10.7 EER	10.1 EER	
Heating Cap [kBtu/h]	0	150.562	
Heating Efficiency	N/A	80% AFUE	
Design Airflow [cfm]	17364	2365	
Fan Demand [kW]	17.031	1.776	
TSP [in. w.g.]	4.6	3.6	
Economizer		Yes, drybulb control	
Heat recovery	None	None	
Associated VAV Boxes	1@ 4127 cfm, 171.44 kBtu/h Heating 1@ 1904 cfm, 79.08 kBtu/h Heating 1@ 2390 cfm, 99.28 kBtu/h Heating 1@1827 cfm, 75.89 kBtu/h Heating 1@ 7116 cfm, 295.60 kBtu/h Heating	N/A	
System 4		***EL1 Sys1 PSV (G.W4)***	
Cooling Cap [kBtu/h] (tons)		61.168 (5.1)	
Cooling Efficiency		12.0 SEER	
Heating Cap [kBtu/h]		114.909	

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
Heating Efficiency		80% AFUE	
Design Airflow [cfm]		2070	
Fan Demand [kW]		1.560	
TSP [in. w.g.]		3.6	
Economizer		Yes, drybulb control	
Heat recovery		None	
Associated VAV Boxes		N/A	
System 5		***EL1 Sys1 PSV (G.C5)***	
Cooling Cap [kBtu/h] (tons)		243.743 (20.3)	
Cooling Efficiency		9.3 EER	
Heating Cap [kBtu/h]		477.926	
Heating Efficiency		80% AFUE	
Design Airflow [cfm]		7253	
Fan Demand [kW]		5.197	
TSP [in. w.g.]		3.4	
Economizer		Yes, drybulb control	
Heat recovery		None	
Associated VAV Boxes		N/A	
System 6		***EL1 Sys1 PSV (M.S11)***	
Cooling Cap [kBtu/h] (tons)		154.296 (12.9)	
Cooling Efficiency		9.5 EER	
Heating Cap [kBtu/h]		288.628	
Heating Efficiency		80% AFUE	
Design Airflow [cfm]		5355	
Fan Demand [kW]		3.882	
TSP [in. w.g.]		3.5	
Economizer		Yes, drybulb control	
Heat recovery		None	
Associated VAV Boxes		N/A	
System 7		***EL1 Sys1 PSV (M.E12)***	
Cooling Cap [kBtu/h] (tons)		73.477 (6.1)	
Cooling Efficiency		10.1 EER	
Heating Cap [kBtu/h]		136.850	
Heating Efficiency		80% AFUE	
Design Airflow [cfm]		2543	
Fan Demand [kW]		1.903	
TSP [in. w.g.]		3.6	

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
Economizer		Yes, drybulb control	
Heat recovery		None	
Associated VAV Boxes		N/A	
System 8		***EL1 Sys1 PSV (M.N13)***	
Cooling Cap [kBtu/h] (tons)		85.006 (7.1)	
Cooling Efficiency		10.1 EER	
Heating Cap [kBtu/h]		165.766	
Heating Efficiency		80% AFUE	
Design Airflow [cfm]		2693	
Fan Demand [kW]		2.007	
TSP [in. w.g.]		3.6	
Economizer		Yes, drybulb control	
Heat recovery		None	
Associated VAV Boxes		N/A	
System 9		***EL1 Sys1 PSV (M.W14)***	
Cooling Cap [kBtu/h] (tons)		69.237 (5.8)	
Cooling Efficiency		10.1 EER	
Heating Cap [kBtu/h]		131.007	
Heating Efficiency		80% AFUE	
Design Airflow [cfm]		2417	
Fan Demand [kW]		1.808	
TSP [in. w.g.]		3.6	
Economizer		Yes, drybulb control	
Heat recovery		None	
Associated VAV Boxes		N/A	
System 10		***EL1 Sys1 PSV (M.C15)***	
Cooling Cap [kBtu/h] (tons)		243.743 (20.3)	
Cooling Efficiency		9.3 EER	
Heating Cap [kBtu/h]		477.926	
Heating Efficiency		80% AFUE	
Design Airflow [cfm]		7253	
Fan Demand [kW]		5.197	
TSP [in. w.g.]		3.4	
Economizer		Yes, drybulb control	
Heat recovery		None	
Associated VAV Boxes		N/A	

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
System 11		***EL1 Sys1 PSV (T.S21)***	
Cooling Cap [kBtu/h] (tons)		163.891 (13.7)	
Cooling Efficiency		9.5 EER	
Heating Cap [kBtu/h]		306.079	
Heating Efficiency		80% AFUE	
Design Airflow [cfm]		5355	
Fan Demand [kW]		3.882	
TSP [in. w.g.]		3.5	
Economizer		Yes, drybulb control	
Heat recovery		None	
Associated VAV Boxes		N/A	
System 12		***EL1 Sys1 PSV (T.E22)***	
Cooling Cap [kBtu/h] (tons)		77.714 (6.5)	
Cooling Efficiency		10.1 EER	
Heating Cap [kBtu/h]		144.801	
Heating Efficiency		80% AFUE	
Design Airflow [cfm]		2543	
Fan Demand [kW]		1.903	
TSP [in. w.g.]		3.6	
Economizer		Yes, drybulb control	
Heat recovery		None	
Associated VAV Boxes		N/A	
System 13		***EL1 Sys1 PSV (T.N23)***	
Cooling Cap [kBtu/h] (tons)		93.509 (7.8)	
Cooling Efficiency		10.1 EER	
Heating Cap [kBtu/h]		182.517	
Heating Efficiency		80% AFUE	
Design Airflow [cfm]		2693	
Fan Demand [kW]		2.007	
TSP [in. w.g.]		3.6	
Economizer		Yes, drybulb control	
Heat recovery		None	
Associated VAV Boxes		N/A	
System 14		***EL1 Sys1 PSV (T.W24)***	
Cooling Cap [kBtu/h] (tons)		73.453 (6.1)	
Cooling Efficiency		10.1 EER	

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
Heating Cap [kBtu/h]		138.945	
Heating Efficiency		80% AFUE	
Design Airflow [cfm]		2417	
Fan Demand [kW]		1.808	
TSP [in. w.g.]		3.6	
Economizer		Yes, drybulb control	
Heat recovery		None	
Associated VAV Boxes		N/A	
System 15		***EL1 Sys1 PSV (T.C25)***	
Cooling Cap [kBtu/h] (tons)		277.411 (23.1)	
Cooling Efficiency		9.3 EER	
Heating Cap [kBtu/h]		546.239	
Heating Efficiency		80% AFUE	
Design Airflow [cfm]		7253	
Fan Demand [kW]		5.197	
TSP [in. w.g.]		3.4	
Economizer		Yes, drybulb control	
Heat recovery		None	
Associated VAV Boxes		N/A	

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
Envelope			
Wall Assembly	Same as baseline Gross Area: 21600 sf Net Area: 13392 sf		
Roof Assembly	Same as baseline Gross Area: 20000 sf		
Window Assembly	Solarban 70XL Starphire w/ thermally broken aluminum frame: U-0.42; SHGC-0.27; VLT-0.543 Gross Area: 8208 sf	Generic glazing: U-0.47; SHGC-0.39	
Interior Loads			
Lighting	Same as baseline		
Daylighting Controls	None	None	
HVAC Systems	Packaged VAV w/ Elec Reheat System fans with VSD	Packaged Single Zone Rooftop Units	
System 1	***EL1 Sys1 PVAVS (G)***	***EL1 Sys1 PSV (G.S1)***	
Cooling Cap [kBtu/h] (tons)	581.254 (48.4)	119.914 (10)	
Cooling Efficiency	10.7 EER	10.1 EER	
Heating Cap [kBtu/h]	0	233.215	
Heating Efficiency	N/A	80% AFUE	
Design Airflow [cfm]	15815	4845	
Fan Demand [kW]	15.545	3.321	
TSP [in. w.g.]	4.6	3.5	
Economizer	None	Yes, drybulb control	
Heat recovery	None	None	
Associated VAV Boxes	1@ 3393 cfm, 140.92 kBtu/h Heating 1@ 1604 cfm, 66.61 kBtu/h Heating 1@ 2056 cfm, 85.40 kBtu/h Heating 1@1646 cfm, 34.19 kBtu/h Heating 1@ 7116 cfm, 295.60 kBtu/h Heating	N/A	
System 2	***EL1 Sys1 PVAVS (M)***	***EL1 Sys1 PSV (G.E2)***	
Cooling Cap [kBtu/h] (tons)	631.169 (52.6)	57.811 (4.8)	

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
Cooling Efficiency	10.7 EER	12 SEER	
Heating Cap [kBtu/h]	0	115.174	
Heating Efficiency	N/A	80% AFUE	
Design Airflow [cfm]	17364	2284	
Fan Demand [kW]	17.031	1.616	
TSP [in. w.g.]	4.6	3.6	
Economizer	None	Yes, drybulb control	
Heat recovery	None	None	
Associated VAV Boxes	1@ 4127 cfm, 171.44 kBtu/h Heating 1@ 1904 cfm, 79.08 kBtu/h Heating 1@ 2390 cfm, 99.28 kBtu/h Heating 1@1827 cfm, 75.89 kBtu/h Heating 1@ 7116 cfm, 295.60 kBtu/h Heating	N/A	
System 3	***EL1 Sys1 PVAVS (T)***	***EL1 Sys1 PSV (G.N3)***	
Cooling Cap [kBtu/h] (tons)	681.777 (56.8)	66.202 (5.5)	
Cooling Efficiency	10.7 EER	10.1 EER	
Heating Cap [kBtu/h]	0	143.172	
Heating Efficiency	N/A	80% AFUE	
Design Airflow [cfm]	17364	2496	
Fan Demand [kW]	17.031	1.758	
TSP [in. w.g.]	4.6	3.6	
Economizer		Yes, drybulb control	
Heat recovery	None	None	
Associated VAV Boxes	1@ 4127 cfm, 171.44 kBtu/h Heating 1@ 1904 cfm, 79.08 kBtu/h Heating 1@ 2390 cfm, 99.28 kBtu/h Heating 1@1827 cfm, 75.89 kBtu/h Heating 1@ 7116 cfm, 295.60 kBtu/h Heating	N/A	
System 4		***EL1 Sys1 PSV (G.W4)***	
Cooling Cap [kBtu/h] (tons)		61.215 (5.1)	
Cooling Efficiency		12.0 SEER	
Heating Cap [kBtu/h]		121.404	

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
Heating Efficiency		80% AFUE	
Design Airflow [cfm]		2430	
Fan Demand [kW]		1.718	
TSP [in. w.g.]		3.6	
Economizer		Yes, drybulb control	
Heat recovery		None	
Associated VAV Boxes		N/A	
System 5		***EL1 Sys1 PSV (G.C5)***	
Cooling Cap [kBtu/h] (tons)		206.324 (17.2)	
Cooling Efficiency		9.3 EER	
Heating Cap [kBtu/h]		458.384	
Heating Efficiency		80% AFUE	
Design Airflow [cfm]		7732	
Fan Demand [kW]		5.197	
TSP [in. w.g.]		3.4	
Economizer		Yes, drybulb control	
Heat recovery		None	
Associated VAV Boxes		N/A	
System 6		***EL1 Sys1 PSV (M.S11)***	
Cooling Cap [kBtu/h] (tons)		145.661 (12.1)	
Cooling Efficiency		9.5 EER	
Heating Cap [kBtu/h]		288.021	
Heating Efficiency		80% AFUE	
Design Airflow [cfm]		5850	
Fan Demand [kW]		3.979	
TSP [in. w.g.]		3.5	
Economizer		Yes, drybulb control	
Heat recovery		None	
Associated VAV Boxes		N/A	
System 7		***EL1 Sys1 PSV (M.E12)***	
Cooling Cap [kBtu/h] (tons)		65.317 (5.4)	
Cooling Efficiency		10.1 EER	
Heating Cap [kBtu/h]		129.097	
Heating Efficiency		80% AFUE	
Design Airflow [cfm]		2605	
Fan Demand [kW]		1.829	
TSP [in. w.g.]		3.6	

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
Economizer		Yes, drybulb control	
Heat recovery		None	
Associated VAV Boxes		N/A	
System 8		***EL1 Sys1 PSV (M.N13)***	
Cooling Cap [kBtu/h] (tons)		76.297 (6.4)	
Cooling Efficiency		10.1 EER	
Heating Cap [kBtu/h]		161.835	
Heating Efficiency		80% AFUE	
Design Airflow [cfm]		2927	
Fan Demand [kW]		2.046	
TSP [in. w.g.]		3.6	
Economizer		Yes, drybulb control	
Heat recovery		None	
Associated VAV Boxes		N/A	
System 9		***EL1 Sys1 PSV (M.W14)***	
Cooling Cap [kBtu/h] (tons)		69.151 (5.8)	
Cooling Efficiency		10.1 EER	
Heating Cap [kBtu/h]		136.119	
Heating Efficiency		80% AFUE	
Design Airflow [cfm]		2770	
Fan Demand [kW]		1.944	
TSP [in. w.g.]		3.6	
Economizer		Yes, drybulb control	
Heat recovery		None	
Associated VAV Boxes		N/A	
System 10		***EL1 Sys1 PSV (M.C15)***	
Cooling Cap [kBtu/h] (tons)		206.324 (17.2)	
Cooling Efficiency		9.3 EER	
Heating Cap [kBtu/h]		458.384	
Heating Efficiency		80% AFUE	
Design Airflow [cfm]		7732	
Fan Demand [kW]		5.197	
TSP [in. w.g.]		3.4	
Economizer		Yes, drybulb control	
Heat recovery		None	
Associated VAV Boxes		N/A	

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
System 11		***EL1 Sys1 PSV (T.S21)***	
Cooling Cap [kBtu/h] (tons)		156.785 (13.1)	
Cooling Efficiency		9.5 EER	
Heating Cap [kBtu/h]		302.514	
Heating Efficiency		80% AFUE	
Design Airflow [cfm]		5850	
Fan Demand [kW]		3.979	
TSP [in. w.g.]		3.5	
Economizer		Yes, drybulb control	
Heat recovery		None	
Associated VAV Boxes		N/A	
System 12		***EL1 Sys1 PSV (T.E22)***	
Cooling Cap [kBtu/h] (tons)		70.771 (5.9)	
Cooling Efficiency		10.1 EER	
Heating Cap [kBtu/h]		135.663	
Heating Efficiency		80% AFUE	
Design Airflow [cfm]		2605	
Fan Demand [kW]		1.829	
TSP [in. w.g.]		3.6	
Economizer		Yes, drybulb control	
Heat recovery		None	
Associated VAV Boxes		N/A	
System 13		***EL1 Sys1 PSV (T.N23)***	
Cooling Cap [kBtu/h] (tons)		86.888 (77.2)	
Cooling Efficiency		10.1 EER	
Heating Cap [kBtu/h]		175.631	
Heating Efficiency		80% AFUE	
Design Airflow [cfm]		2927	
Fan Demand [kW]		2.046	
TSP [in. w.g.]		3.6	
Economizer		Yes, drybulb control	
Heat recovery		None	
Associated VAV Boxes		N/A	
System 14		***EL1 Sys1 PSV (T.W24)***	
Cooling Cap [kBtu/h] (tons)		73.913 (6.2)	
Cooling Efficiency		10.1 EER	

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
Heating Cap [kBtu/h]		142.721	
Heating Efficiency		80% AFUE	
Design Airflow [cfm]		2770	
Fan Demand [kW]		1.944	
TSP [in. w.g.]		3.6	
Economizer		Yes, drybulb control	
Heat recovery		None	
Associated VAV Boxes		N/A	
System 15		***EL1 Sys1 PSV (T.C25)***	
Cooling Cap [kBtu/h] (tons)		249.234 (20.8)	
Cooling Efficiency		9.3 EER	
Heating Cap [kBtu/h]		514.243	
Heating Efficiency		80% AFUE	
Design Airflow [cfm]		7732	
Fan Demand [kW]		5.197	
TSP [in. w.g.]		3.4	
Economizer		Yes, drybulb control	
Heat recovery		None	
Associated VAV Boxes		N/A	

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
Envelope			
Wall	Same as baseline Gross Area: 21600 sf Net Area: 17712 sf		
Roof	R-30; Insulation entirely above deck; Absorptance = 0.7 Gross Area: 20000 sf	R-15; Insulation entirely above deck; Absorptance = 0.7	
Window	Solarban 70XL Starphire w/ thermally broken aluminum frame U-0.42; SHGC-0.27; VLT-0.543 Gross Area: 3888 sf	Generic glazing: U-0.47; SHGC-0.39	
Interior Loads			
Lighting	Same as baseline		
Daylighting Controls	None	None	
HVAC Systems	Packaged VAV w/ Elec Reheat System fans with VSD	Packaged Single Zone Rooftop Units	
System 1	***EL1 Sys1 PVAVS (G)***	***EL1 Sys1 PSV (G.S1)***	
Cooling Cap [kBtu/h] (tons)	524.467 (43.7)	89.780 (7.5)	
Cooling Efficiency	10.7 EER	10.1 EER	
Heating Cap [kBtu/h]	0	157.050	
Heating Efficiency		80%	
Design Airflow [cfm]	13463	2804	
Fan Demand [kW]	13.233	2.121	
TSP [in. w.g.]	4.6	3.6	
Economizer	None	Yes, Drybulb	
Heat recovery	None	None	
Associated VAV Boxes	1@ 2332 cfm, 96.89 kBtu/h Heating 1@ 1116 cfm, 46.38 kBtu/h Heating 1@ 1739cfm, 36.11 kBtu/h Heating 1@1159 cfm, 48.15 kBtu/h Heating 1@ 7116 cfm, 295.60 kBtu/h Heating	N/A	
Component	Alternative Building	ASHRAE 90.1-2004	Notes

		Baseline Building (0° Rotation)	
System 2	***EL1 Sys1 PVAVS (M)***	***EL1 Sys1 PSV (G.E2)***	
Cooling Cap [kBtu/h] (tons)	560.315 (46.7)	45.733 (3.8)	
Cooling Efficiency	10.7 EER	12 SEER	
Heating Cap [kBtu/h]	0	79.192	
Heating Efficiency		80%	
Design Airflow [cfm]	14483	1326	
Fan Demand [kW]	14.205	1.039	
TSP [in. w.g.]	4.6	3.7	
Economizer	None	Yes, Drybulb	
Heat recovery	None	None	
Associated VAV Boxes	1@ 2777 cfm, 115.37 kBtu/h Heating 1@ 1302 cfm, 54.08 kBtu/h Heating 1@ 2005 cfm, 41.64 kBtu/h Heating 1@1283 cfm, 26.64 kBtu/h Heating 1@ 7116 cfm, 295.60 kBtu/h Heating	N/A	
System 3	***EL1 Sys1 PVAVS (T)***	***EL1 Sys1 PSV (G.N3)***	
Cooling Cap [kBtu/h] (tons)	582.831 (48.6)	69.973 (5.8)	
Cooling Efficiency	10.7 EER	10.1 EER	
Heating Cap [kBtu/h]	0	123.952	
Heating Efficiency		80%	
Design Airflow [cfm]	14483	1875	
Fan Demand [kW]	14.205	1.445	
TSP [in. w.g.]	4.6	3.6	
Economizer		Yes, Drybulb	
Heat recovery	None	None	
Associated VAV Boxes	1@ 2777 cfm, 115.37 kBtu/h Heating 1@ 1302 cfm, 54.08 kBtu/h Heating 1@ 2005 cfm, 41.64 kBtu/h Heating 1@1283 cfm, 26.64 kBtu/h Heating 1@ 7116 cfm, 295.60 kBtu/h Heating	N/A	
System 4		***EL1 Sys1 PSV (G.W4)***	
Cooling Cap [kBtu/h] (tons)		46.084 (3.8)	

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
Cooling Efficiency		12.0 SEER	
Heating Cap [kBtu/h]		81.129	
Heating Efficiency		80%	
Design Airflow [cfm]		1368	
Fan Demand [kW]		1.070	
TSP [in. w.g.]		3.7	
Economizer		Yes, Drybulb	
Heat recovery		None	
Associated VAV Boxes		N/A	
System 5		***EL1 Sys1 PSV (G.C5)***	
Cooling Cap [kBtu/h] (tons)		263.914 (22.0)	
Cooling Efficiency		9.3 EER	
Heating Cap [kBtu/h]		455.112	
Heating Efficiency		80%	
Design Airflow [cfm]		7116	
Fan Demand [kW]		5.197	
TSP [in. w.g.]		3.4	
Economizer		Yes, Drybulb	
Heat recovery		None	
Associated VAV Boxes		N/A	
System 6		***EL1 Sys1 PSV (M.S11)***	
Cooling Cap [kBtu/h] (tons)		111.089 (9.3)	
Cooling Efficiency		9.5 EER	
Heating Cap [kBtu/h]		194.440	
Heating Efficiency		80%	
Design Airflow [cfm]		3368	
Fan Demand [kW]		2.529	
TSP [in. w.g.]		3.5	
Economizer		Yes, Drybulb	
Heat recovery		None	
Associated VAV Boxes		N/A	
System 7		***EL1 Sys1 PSV (M.E12)***	
Cooling Cap [kBtu/h] (tons)		52.001 (4.3)	
Cooling Efficiency		10.1 EER	
Heating Cap [kBtu/h]		90.577	
Heating Efficiency		80%	
Design Airflow [cfm]		1567	

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
Fan Demand [kW]		1.218	
TSP [in. w.g.]		3.7	
Economizer		Yes, Drybulb	
Heat recovery		None	
Associated VAV Boxes		N/A	
System 8		***EL1 Sys1 PSV (M.N13)***	
Cooling Cap [kBtu/h] (tons)		77.655 (6.5)	
Cooling Efficiency		10.1 EER	
Heating Cap [kBtu/h]		137.679	
Heating Efficiency		80%	
Design Airflow [cfm]		2164	
Fan Demand [kW]		1.656	
TSP [in. w.g.]		3.6	
Economizer		Yes, Drybulb	
Heat recovery		None	
Associated VAV Boxes		N/A	
System 9		***EL1 Sys1 PSV (M.W14)***	
Cooling Cap [kBtu/h] (tons)		49.841 (4.2)	
Cooling Efficiency		10.1 EER	
Heating Cap [kBtu/h]		88.003	
Heating Efficiency		80%	
Design Airflow [cfm]		1513	
Fan Demand [kW]		1.178	
TSP [in. w.g.]		3.7	
Economizer		Yes, Drybulb	
Heat recovery		None	
Associated VAV Boxes		N/A	
System 10		***EL1 Sys1 PSV (M.C15)***	
Cooling Cap [kBtu/h] (tons)		263.914 (22.0)	
Cooling Efficiency		9.3 EER	
Heating Cap [kBtu/h]		455.112	
Heating Efficiency		80%	
Design Airflow [cfm]		7116	
Fan Demand [kW]		5.197	
TSP [in. w.g.]		3.4	
Economizer		Yes, Drybulb	
Heat recovery		None	

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
Associated VAV Boxes		N/A	
System 11		***EL1 Sys1 PSV (T.S21)***	
Cooling Cap [kBtu/h] (tons)		119.151 (9.9)	
Cooling Efficiency		9.5 EER	
Heating Cap [kBtu/h]		210.425	
Heating Efficiency		80%	
Design Airflow [cfm]		3368	
Fan Demand [kW]		2.529	
TSP [in. w.g.]		3.5	
Economizer		Yes, Drybulb	
Heat recovery		None	
Associated VAV Boxes		N/A	
System 12		***EL1 Sys1 PSV (T.E22)***	
Cooling Cap [kBtu/h] (tons)		55.756 (4.6)	
Cooling Efficiency		10.1 EER	
Heating Cap [kBtu/h]		97.945	
Heating Efficiency		80%	
Design Airflow [cfm]		1567	
Fan Demand [kW]		1.218	
TSP [in. w.g.]		3.7	
Economizer		Yes, Drybulb	
Heat recovery		None	
Associated VAV Boxes		N/A	
System 13		***EL1 Sys1 PSV (T.N23)***	
Cooling Cap [kBtu/h] (tons)		84.652 (7.1)	
Cooling Efficiency		10.1 EER	
Heating Cap [kBtu/h]		153.183	
Heating Efficiency		80%	
Design Airflow [cfm]		2164	
Fan Demand [kW]		1.656	
TSP [in. w.g.]		3.6	
Economizer		Yes, Drybulb	
Heat recovery		None	
Associated VAV Boxes		N/A	

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
System 14		***EL1 Sys1 PSV (T.W24)***	
Cooling Cap [kBtu/h] (tons)		53.134 (4.4)	
Cooling Efficiency		10.1 EER	
Heating Cap [kBtu/h]		95.357	
Heating Efficiency		80%	
Design Airflow [cfm]		1513	
Fan Demand [kW]		1.178	
TSP [in. w.g.]		3.7	
Economizer		Yes, Drybulb	
Heat recovery		None	
Associated VAV Boxes		N/A	
System 15		***EL1 Sys1 PSV (T.C25)***	
Cooling Cap [kBtu/h] (tons)		294.683 (24.6)	
Cooling Efficiency		9.3 EER	
Heating Cap [kBtu/h]		518.652	
Heating Efficiency		80%	
Design Airflow [cfm]		7116	
Fan Demand [kW]		5.197	
TSP [in. w.g.]		3.4	
Economizer		Yes, Drybulb	
Heat recovery		None	
Associated VAV Boxes		N/A	

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
Envelope			
Wall	Same as baseline		
Roof	R-30; Insulation entirely above deck; Absorptance = 0.7	R-15; Insulation entirely above deck; Absorptance = 0.7	
Window	Solarban 70XL Starphire w/ thermally broken aluminum frame U-0.42; SHGC-0.27; VLT-0.543	Generic glazing: U-0.47; SHGC-0.39	
Interior Loads			
Lighting	Same as baseline		
Daylighting Controls	None	None	
HVAC Systems	Packaged VAV w/ Elec Reheat System fans with VSD	Packaged Single Zone Rooftop Units	
System 1	***EL1 Sys1 PVAVS (G)***	***EL1 Sys1 PSV (G.S1)***	
Cooling Cap [kBtu/h] (tons)	490.277 (40.9)	85.457 (7.1)	
Cooling Efficiency	10.7 EER	10.1 EER	
Heating Cap [kBtu/h]	0	159.278	
Heating Efficiency	N/A	80%	
Design Airflow [cfm]	13705	2841	
Fan Demand [kW]	13.233	2.076	
TSP [in. w.g.]	4.6	3.5	
Economizer	None	Yes, Drybulb	
Heat recovery	None	None	
Associated VAV Boxes	1@ 2355 cfm, 95.96 kBtu/h Heating 1@ 1182 cfm, 48.17 kBtu/h Heating 1@ 1762 cfm, 35.90 kBtu/h Heating 1@ 1154 cfm, 47.02 kBtu/h Heating 1@ 7253 cfm, 295.60 kBtu/h Heating	N/A	
System 2	***EL1 Sys1 PVAVS (M)***	***EL1 Sys1 PSV (G.E2)***	
Cooling Cap [kBtu/h] (tons)	523.064 (43.6)	44.511 (3.7)	
Cooling Efficiency	10.7 EER	12 SEER	

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
Heating Cap [kBtu/h]	0	84.563	
Heating Efficiency	N/A	80%	
Design Airflow [cfm]	14722	1413	
Fan Demand [kW]	14.167	1.066	
TSP [in. w.g.]	4.6	3.6	
Economizer	None	Yes, Drybulb	
Heat recovery	None	None	
Associated VAV Boxes	1@ 2806 cfm, 114.34 kBtu/h Heating 1@ 1357 cfm, 55.29 kBtu/h Heating 1@ 2015 cfm, 82.11 kBtu/h Heating 1@ 1292 cfm, 52.67 kBtu/h Heating 1@ 7253 cfm, 295.60 kBtu/h Heating	N/A	
System 3	***EL1 Sys1 PVAVS (T)***	***EL1 Sys1 PSV (G.N3)***	
Cooling Cap [kBtu/h] (tons)	550.098 (45.8)	64.773 (5.4)	
Cooling Efficiency	10.7 EER	10.1 EER	
Heating Cap [kBtu/h]	0	128.980	
Heating Efficiency	N/A	80%	
Design Airflow [cfm]	14722	1898	
Fan Demand [kW]	14.167	1.425	
TSP [in. w.g.]	4.6	3.6	
Economizer	None	Yes, Drybulb	
Heat recovery	None	None	
Associated VAV Boxes	1@ 2806 cfm, 114.34 kBtu/h Heating 1@ 1357 cfm, 55.29 kBtu/h Heating 1@ 2015 cfm, 82.11 kBtu/h Heating 1@ 1292 cfm, 52.67 kBtu/h Heating 1@ 7253 cfm, 295.60 kBtu/h Heating	N/A	
System 4		***EL1 Sys1 PSV (G.W4)***	
Cooling Cap [kBtu/h] (tons)		43.042 (3.6)	
Cooling Efficiency		12.0 SEER	
Heating Cap [kBtu/h]		82.302	
Heating Efficiency		80%	

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
Design Airflow [cfm]		1364	
Fan Demand [kW]		1.028	
TSP [in. w.g.]		3.6	
Economizer		Yes, Drybulb	
Heat recovery		None	
Associated VAV Boxes		N/A	
System 5		***EL1 Sys1 PSV (G.C5)***	
Cooling Cap [kBtu/h] (tons)		243.743 (20.3)	
Cooling Efficiency		9.3 EER	
Heating Cap [kBtu/h]		477.926	
Heating Efficiency		80%	
Design Airflow [cfm]		7253	
Fan Demand [kW]		5.197	
TSP [in. w.g.]		3.4	
Economizer		Yes, Drybulb	
Heat recovery		None	
Associated VAV Boxes		N/A	
System 6		***EL1 Sys1 PSV (M.S11)***	
Cooling Cap [kBtu/h] (tons)		104.560 (8.7)	
Cooling Efficiency		9.5 EER	
Heating Cap [kBtu/h]		198.464	
Heating Efficiency		80%	
Design Airflow [cfm]		3408	
Fan Demand [kW]		2.471	
TSP [in. w.g.]		3.5	
Economizer		Yes, Drybulb	
Heat recovery		None	
Associated VAV Boxes		N/A	
System 7		***EL1 Sys1 PSV (M.E12)***	
Cooling Cap [kBtu/h] (tons)		50.184 (4.2)	
Cooling Efficiency		10.1 EER	
Heating Cap [kBtu/h]		94.810	
Heating Efficiency		80%	
Design Airflow [cfm]		1634	
Fan Demand [kW]		1.223	
TSP [in. w.g.]		3.6	
Economizer		Yes, Drybulb	

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
Heat recovery		None	
Associated VAV Boxes		N/A	
System 8		***EL1 Sys1 PSV (M.N13)***	
Cooling Cap [kBtu/h] (tons)		71.414 (6.0)	
Cooling Efficiency		10.1 EER	
Heating Cap [kBtu/h]		141.516	
Heating Efficiency		80%	
Design Airflow [cfm]		2168	
Fan Demand [kW]		1.616	
TSP [in. w.g.]		3.6	
Economizer		Yes, Drybulb	
Heat recovery		None	
Associated VAV Boxes		N/A	
System 9		***EL1 Sys1 PSV (M.W14)***	
Cooling Cap [kBtu/h] (tons)		47.014 (3.9)	
Cooling Efficiency		10.1 EER	
Heating Cap [kBtu/h]		89.495	
Heating Efficiency		80%	
Design Airflow [cfm]		1519	
Fan Demand [kW]		1.137	
TSP [in. w.g.]		3.6	
Economizer		Yes, Drybulb	
Heat recovery		None	
Associated VAV Boxes		N/A	
System 10		***EL1 Sys1 PSV (M.C15)***	
Cooling Cap [kBtu/h] (tons)		243.743 (20.3)	
Cooling Efficiency		9.3 EER	
Heating Cap [kBtu/h]		477.926	
Heating Efficiency		80%	
Design Airflow [cfm]		7253	
Fan Demand [kW]		5.197	
TSP [in. w.g.]		3.4	
Economizer		Yes, Drybulb	
Heat recovery		None	
Associated VAV Boxes		N/A	

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
System 11		***EL1 Sys1 PSV (T.S21)***	
Cooling Cap [kBtu/h] (tons)		113.653 (9.5)	
Cooling Efficiency		9.5 EER	
Heating Cap [kBtu/h]		215.633	
Heating Efficiency		80%	
Design Airflow [cfm]		3408	
Fan Demand [kW]		2.471	
TSP [in. w.g.]		3.5	
Economizer		Yes, Drybulb	
Heat recovery		None	
Associated VAV Boxes		N/A	
System 12		***EL1 Sys1 PSV (T.E22)***	
Cooling Cap [kBtu/h] (tons)		54.211 (4.5)	
Cooling Efficiency		10.1 EER	
Heating Cap [kBtu/h]		102.644	
Heating Efficiency		80%	
Design Airflow [cfm]		1634	
Fan Demand [kW]		1.223	
TSP [in. w.g.]		3.6	
Economizer		Yes, Drybulb	
Heat recovery		None	
Associated VAV Boxes		N/A	
System 13		***EL1 Sys1 PSV (T.N23)***	
Cooling Cap [kBtu/h] (tons)		79.541 (6.6)	
Cooling Efficiency		10.1 EER	
Heating Cap [kBtu/h]		158.007	
Heating Efficiency		80%	
Design Airflow [cfm]		2168	
Fan Demand [kW]		1.616	
TSP [in. w.g.]		3.6	
Economizer		Yes, Drybulb	
Heat recovery		None	
Associated VAV Boxes		N/A	
System 14		***EL1 Sys1 PSV (T.W24)***	
Cooling Cap [kBtu/h] (tons)		50.974 (4.2)	
Cooling Efficiency		10.1 EER	

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
Heating Cap [kBtu/h]		97.300	
Heating Efficiency		80%	
Design Airflow [cfm]		1519	
Fan Demand [kW]		1.137	
TSP [in. w.g.]		3.6	
Economizer		Yes, Drybulb	
Heat recovery		None	
Associated VAV Boxes		N/A	
System 15		***EL1 Sys1 PSV (T.C25)***	
Cooling Cap [kBtu/h] (tons)		277.411 (23.1)	
Cooling Efficiency		9.3 EER	
Heating Cap [kBtu/h]		546.239	
Heating Efficiency		80%	
Design Airflow [cfm]		7253	
Fan Demand [kW]		5.197	
TSP [in. w.g.]		3.4	
Economizer		Yes, Drybulb	
Heat recovery		None	
Associated VAV Boxes		N/A	

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
Envelope			
Wall	Same as baseline		
Roof	R-30; Insulation entirely above deck; Absorptance = 0.7	R-15; Insulation entirely above deck; Absorptance = 0.7	
Window	Solarban 70XL Starphire w/ thermally broken aluminum frame U-0.42; SHGC-0.27; VLT-0.543	Generic glazing: U-0.47; SHGC-0.39	
Interior Loads			
Lighting	Same as baseline		
Daylighting Controls	None	None	
HVAC Systems	Packaged VAV w/ Elec Reheat System fans with VSD	Packaged Single Zone Rooftop Units	
System 1	***EL1 Sys1 PVAVS (G)***	***EL1 Sys1 PSV (G.S1)***	
Cooling Cap [kBtu/h] (tons)	405.744 (33.8)	78.999 (6.6)	
Cooling Efficiency	10.7 EER	10.1 EER	
Heating Cap [kBtu/h]	0	157.700	
Heating Efficiency	N/A	80%	
Design Airflow [cfm]	14607	3101	
Fan Demand [kW]	13.214	2.126	
TSP [in. w.g.]	4.6	3.5	
Economizer	None	Yes, Drybulb	
Heat recovery	None	None	
Associated VAV Boxes	1@ 2589 cfm, 99.00 kBtu/h Heating 1@ 1182 cfm, 45.19 kBtu/h Heating 1@ 1803 cfm, 68.93 kBtu/h Heating 1@ 1300 cfm, 49.71 kBtu/h Heating 1@ 7732 cfm, 295.60 kBtu/h Heating	N/A	
System 2	***EL1 Sys1 PVAVS (M)***	***EL1 Sys1 PSV (G.E2)***	
Cooling Cap [kBtu/h] (tons)	438.485 (36.5)	37.870 (3.2)	
Cooling Efficiency	10.7 EER	12 SEER	

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
Heating Cap [kBtu/h]	0	78.601	
Heating Efficiency	N/A	80%	
Design Airflow [cfm]	15847	1438	
Fan Demand [kW]	14.304	1.017	
TSP [in. w.g.]	4.6	3.6	
Economizer	None	Yes, Drybulb	
Heat recovery	None	None	
Associated VAV Boxes	1@ 3113 cfm, 119.01 kBtu/h Heating 1@ 1385 cfm, 52.96 kBtu/h Heating 1@ 2133 cfm, 81.56 kBtu/h Heating 1@ 1483 cfm, 56.69 kBtu/h Heating 1@ 7732 cfm, 295.60 kBtu/h Heating	N/A	
System 3	***EL1 Sys1 PVAVS (T)***	***EL1 Sys1 PSV (G.N3)***	
Cooling Cap [kBtu/h] (tons)	469.363 (39.1)	53.235 (4.4)	
Cooling Efficiency	10.7 EER	10.1 EER	
Heating Cap [kBtu/h]	0	119.423	
Heating Efficiency	N/A	80%	
Design Airflow [cfm]	15847	1947	
Fan Demand [kW]	14.304	1.372	
TSP [in. w.g.]	4.6	3.6	
Economizer	None	Yes, Drybulb	
Heat recovery	None	None	
Associated VAV Boxes	1@ 3113 cfm, 119.01 kBtu/h Heating 1@ 1385 cfm, 52.96 kBtu/h Heating 1@ 2133 cfm, 81.56 kBtu/h Heating 1@ 1483 cfm, 56.69 kBtu/h Heating 1@ 7732 cfm, 295.60 kBtu/h Heating	N/A	
System 4		***EL1 Sys1 PSV (G.W4)***	
Cooling Cap [kBtu/h] (tons)		40.750 (3.4)	
Cooling Efficiency		12.0 SEER	
Heating Cap [kBtu/h]		83.851	
Heating Efficiency		80%	

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
Design Airflow [cfm]		1562	
Fan Demand [kW]		1.104	
TSP [in. w.g.]		3.6	
Economizer		Yes, Drybulb	
Heat recovery		None	
Associated VAV Boxes		N/A	
System 5		***EL1 Sys1 PSV (G.C5)***	
Cooling Cap [kBtu/h] (tons)		206.324 (17.2)	
Cooling Efficiency		9.3 EER	
Heating Cap [kBtu/h]		458.384	
Heating Efficiency		80%	
Design Airflow [cfm]		7732	
Fan Demand [kW]		5.197	
TSP [in. w.g.]		3.4	
Economizer		Yes, Drybulb	
Heat recovery		None	
Associated VAV Boxes		N/A	
System 6		***EL1 Sys1 PSV (M.S11)***	
Cooling Cap [kBtu/h] (tons)		95.576 (8.0)	
Cooling Efficiency		9.5 EER	
Heating Cap [kBtu/h]		197.363	
Heating Efficiency		80%	
Design Airflow [cfm]		3757	
Fan Demand [kW]		2.555	
TSP [in. w.g.]		3.5	
Economizer		Yes, Drybulb	
Heat recovery		None	
Associated VAV Boxes		N/A	
System 7		***EL1 Sys1 PSV (M.E12)***	
Cooling Cap [kBtu/h] (tons)		43.087 (3.6)	
Cooling Efficiency		10.1 EER	
Heating Cap [kBtu/h]		88.250	
Heating Efficiency		80%	
Design Airflow [cfm]		1660	
Fan Demand [kW]		1.165	
TSP [in. w.g.]		3.6	
Economizer		Yes, Drybulb	

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
Heat recovery		None	
Associated VAV Boxes		N/A	
System 8		***EL1 Sys1 PSV (M.N13)***	
Cooling Cap [kBtu/h] (tons)		61.246 (5.1)	
Cooling Efficiency		10.1 EER	
Heating Cap [kBtu/h]		134.202	
Heating Efficiency		80%	
Design Airflow [cfm]		2288	
Fan Demand [kW]		1.600	
TSP [in. w.g.]		3.6	
Economizer		Yes, Drybulb	
Heat recovery		None	
Associated VAV Boxes		N/A	
System 9		***EL1 Sys1 PSV (M.W14)***	
Cooling Cap [kBtu/h] (tons)		45.847 (3.8)	
Cooling Efficiency		10.1 EER	
Heating Cap [kBtu/h]		93.284	
Heating Efficiency		80%	
Design Airflow [cfm]		1779	
Fan Demand [kW]		1.249	
TSP [in. w.g.]		3.6	
Economizer		Yes, Drybulb	
Heat recovery		None	
Associated VAV Boxes		N/A	
System 10		***EL1 Sys1 PSV (M.C15)***	
Cooling Cap [kBtu/h] (tons)		206.324 (17.2)	
Cooling Efficiency		9.3 EER	
Heating Cap [kBtu/h]		458.384	
Heating Efficiency		80%	
Design Airflow [cfm]		7732	
Fan Demand [kW]		5.197	
TSP [in. w.g.]		3.4	
Economizer		Yes, Drybulb	
Heat recovery		None	
Associated VAV Boxes		N/A	

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
System 11		***EL1 Sys1 PSV (T.S21)***	
Cooling Cap [kBtu/h] (tons)		107.297 (8.9)	
Cooling Efficiency		9.5 EER	
Heating Cap [kBtu/h]		211.599	
Heating Efficiency		80%	
Design Airflow [cfm]		3757	
Fan Demand [kW]		2.555	
TSP [in. w.g.]		3.5	
Economizer		Yes, Drybulb	
Heat recovery		None	
Associated VAV Boxes		N/A	
System 12		***EL1 Sys1 PSV (T.E22)***	
Cooling Cap [kBtu/h] (tons)		48.332 (4.0)	
Cooling Efficiency		10.1 EER	
Heating Cap [kBtu/h]		94.695	
Heating Efficiency		80%	
Design Airflow [cfm]		1660	
Fan Demand [kW]		1.165	
TSP [in. w.g.]		3.6	
Economizer		Yes, Drybulb	
Heat recovery		None	
Associated VAV Boxes		N/A	
System 13		***EL1 Sys1 PSV (T.N23)***	
Cooling Cap [kBtu/h] (tons)		71.439 (6.0)	
Cooling Efficiency		10.1 EER	
Heating Cap [kBtu/h]		147.724	
Heating Efficiency		80%	
Design Airflow [cfm]		2288	
Fan Demand [kW]		1.600	
TSP [in. w.g.]		3.6	
Economizer		Yes, Drybulb	
Heat recovery		None	
Associated VAV Boxes		N/A	
System 14		***EL1 Sys1 PSV (T.W24)***	
Cooling Cap [kBtu/h] (tons)		50.442 (4.2)	
Cooling Efficiency		10.1 EER	

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
Heating Cap [kBtu/h]		99.775	
Heating Efficiency		80%	
Design Airflow [cfm]		1779	
Fan Demand [kW]		1.249	
TSP [in. w.g.]		3.6	
Economizer		Yes, Drybulb	
Heat recovery		None	
Associated VAV Boxes		N/A	
System 15		***EL1 Sys1 PSV (T.C25)***	
Cooling Cap [kBtu/h] (tons)		249.234 (20.8)	
Cooling Efficiency		9.3 EER	
Heating Cap [kBtu/h]		514.243	
Heating Efficiency		80%	
Design Airflow [cfm]		7732	
Fan Demand [kW]		5.197	
TSP [in. w.g.]		3.4	
Economizer		Yes, Drybulb	
Heat recovery		None	
Associated VAV Boxes		N/A	

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
Envelope			
Wall Assembly	R-21+7.5ci wall Gross Area: 5834 sf Net Area:3617 sf	R-13	
Roof Assembly	R-40; Insulation entirely above deck; Absorptance = 0.7 Gross Area: 10000 sf	R-15; Insulation entirely above deck; Absorptance = 0.7	
Window Assembly	Solarban 80 w/ thermally broken aluminum frame: U-0.41; SHGC-0.24; VLT-0.407 Gross Area:2217 sf	Generic glazing: U-0.57; SHGC-0.39	
Interior Loads			
Lighting	LPD= 0.8 W/sf (T-5 lamps)	LPD= 1.0 W/sf (T-8 lamps)	
Daylighting Controls	None	None	
HVAC Systems	Split system with dedicated ERV (independent fans); 90% eff. furnace	Packaged Single Zone Rooftop Units	
System 1	***EL1 Sys1 PVVT (G.S1)***	***EL1 Sys1 PSV (G.S1)***	
Cooling Cap [kBtu/h] (Tons)	55.840 (4.66)	89.654 (7.5)	
Cooling Efficiency	11.5 EER	10.1 EER	
Heating Cap [kBtu/h]	99.112	160.163	
Heating Efficiency	90% AFUE	80% AFUE	
Design Airflow [cfm]	1859	2679	
Fan Demand [kW]	1.495	2.031	
TSP [in. w.g.]	3.5	3.5	
Economizer	Yes, OA drybulb control	None	
Heat recovery	Dedicated, stand-alone total enthalpy wheel: 76% sensible eff., 74% latent eff.	None	
System 2	***EL1 Sys1 PVVT (G.E2)***	***EL1 Sys1 PSV (G.E2)***	
Cooling Cap [kBtu/h] (Tons)	30.376 (2.53)	46.834 (3.9)	
Cooling Efficiency	14 SEER	12 SEER	
Heating Cap [kBtu/h]	53.527	83.244	
Heating Efficiency	90% AFUE	80% AFUE	
Design Airflow [cfm]	984	1386	
Fan Demand [kW]	0.815	1.086	
TSP [in. w.g.]	3.6	3.7	
Economizer	Yes, OA drybulb control	None	
Heat recovery	Dedicated, stand-alone total	None	

	enthalpy wheel: 76% sensible eff., 74% latent eff.		
Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
System 3	***EL1 Sys1 PVVT (G.N3)***	***EL1 Sys1 PSV (G.N3)***	
Cooling Cap [kBtu/h] (Tons)	39.369 (3.3)	58.131 (4.8)	
Cooling Efficiency	14 SEER	12 SEER	
Heating Cap [kBtu/h]	70.097	104.744	
Heating Efficiency	90% AFUE	80% AFUE	
Design Airflow [cfm]	1217	1510	
Fan Demand [kW]	1.006	1.178	
TSP [in. w.g.]	3.6	3.6	
Economizer	Yes, OA drybulb control	None	
Heat recovery	Dedicated, stand-alone total enthalpy wheel: 76% sensible eff., 74% latent eff.	None	
System 4	***EL1 Sys1 PVVT (G.W4)***	***EL1 Sys1 PSV (G.W4)***	
Cooling Cap [kBtu/h] (Tons)	31.924 (2.7)	47.880 (4.0)	
Cooling Efficiency	14 SEER	12 SEER	
Heating Cap [kBtu/h]	56.287	85.684	
Heating Efficiency	90% AFUE	80% AFUE	
Design Airflow [cfm]	1043	1439	
Fan Demand [kW]	0.864	1.124	
TSP [in. w.g.]	3.6	3.6	
Economizer	Yes, OA drybulb control	None	
Heat recovery	Dedicated, stand-alone total enthalpy wheel: 76% sensible eff., 74% latent eff.	None	
System 5	***EL1 Sys1 PVVT (G.C5)***	***EL1 Sys1 PSV (G.C5)***	
Cooling Cap [kBtu/h] (Tons)	82.516 (6.9)	112.161 (9.3)	
Cooling Efficiency	11.5 EER	10.1 EER	
Heating Cap [kBtu/h]	144.874	196.211	
Heating Efficiency	90% AFUE	80% AFUE	
Design Airflow [cfm]	2781	2781	
Fan Demand [kW]	2.230	2.104	
TSP [in. w.g.]	3.5	3.5	
Economizer	Yes, OA drybulb control	None	
Heat recovery	Dedicated, stand-alone total enthalpy wheel: 76% sensible eff., 74% latent eff.	None	

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
Envelope			
Wall Assembly	R-21+7.5ci wall Gross Area: 5834 sf Net Area:3617 sf	R-13	
Roof Assembly	R-40; Insulation entirely above deck; Absorptance = 0.7 Gross Area: 10000 sf	R-15; Insulation entirely above deck; Absorptance = 0.7	
Window Assembly	Solarban 80 w/ thermally broken aluminum frame: U-0.41; SHGC-0.24; VLT-0.407 Gross Area:2217 sf	Generic glazing: U-0.57; SHGC-0.39	
Interior Loads			
Lighting	LPD= 0.8 W/sf (T-5 lamps)	LPD= 1.0 W/sf (T-8 lamps)	
Daylighting Controls	None	None	
HVAC Systems	Split system with dedicated ERV (independent fans); 90% eff. furnace	Packaged Single Zone Rooftop Units	
System 1	***EL1 Sys1 PVVT (G.S1)***	***EL1 Sys1 PSV (G.S1)***	
Cooling Cap [kBtu/h] (Tons)	55.875 (4.7)	85.694 (7.1)	
Cooling Efficiency	11.5 EER	10.1 EER	
Heating Cap [kBtu/h]	98.537	163.509	
Heating Efficiency	90% AFUE	80% AFUE	
Design Airflow [cfm]	1877	2731	
Fan Demand [kW]	1.481	2.032	
TSP [in. w.g.]	3.5	3.5	
Economizer	Yes, OA drybulb control	None	
Heat recovery	Dedicated, stand-alone total enthalpy wheel: 76% sensible eff., 74% latent eff.	None	
System 2	***EL1 Sys1 PVVT (G.E2)***	***EL1 Sys1 PSV (G.E2)***	
Cooling Cap [kBtu/h] (Tons)	31.805 (2.7)	47.162 (3.9)	
Cooling Efficiency	14 SEER	12 SEER	
Heating Cap [kBtu/h]	56.808	89.743	
Heating Efficiency	90% AFUE	80% AFUE	
Design Airflow [cfm]	1066	1515	
Fan Demand [kW]	0.866	1.164	
TSP [in. w.g.]	3.6	3.7	
Economizer	Yes, OA drybulb control	None	
Heat recovery	Dedicated, stand-alone total enthalpy wheel: 76% sensible eff., 74% latent eff.	None	

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
System 3	***EL1 Sys1 PVVT (G.N3)***	***EL1 Sys1 PSV (G.N3)***	
Cooling Cap [kBtu/h] (Tons)	38.903 (3.2)	53.520 (4.5)	
Cooling Efficiency	14 SEER	12 SEER	
Heating Cap [kBtu/h]	70.939	108.393	
Heating Efficiency	90% AFUE	80% AFUE	
Design Airflow [cfm]	1245	1540	
Fan Demand [kW]	1.010	1.179	
TSP [in. w.g.]	3.6	3.6	
Economizer	Yes, OA drybulb control	None	
Heat recovery	Dedicated, stand-alone total enthalpy wheel: 76% sensible eff., 74% latent eff.	None	
System 4	***EL1 Sys1 PVVT (G.W4)***	***EL1 Sys1 PSV (G.W4)***	
Cooling Cap [kBtu/h] (Tons)	31.856 (2.7)	45.706 (3.8)	
Cooling Efficiency	14 SEER	12 SEER	
Heating Cap [kBtu/h]	56.389	87.745	
Heating Efficiency	90% AFUE	80% AFUE	
Design Airflow [cfm]	1058	1472	
Fan Demand [kW]	0.860	1.129	
TSP [in. w.g.]	3.6	3.6	
Economizer	Yes, OA drybulb control	None	
Heat recovery	Dedicated, stand-alone total enthalpy wheel: 76% sensible eff., 74% latent eff.	None	
System 5	***EL1 Sys1 PVVT (G.C5)***	***EL1 Sys1 PSV (G.C5)***	
Cooling Cap [kBtu/h] (Tons)	85.490 (7.1)	103.139 (8.6)	
Cooling Efficiency	11.5 EER	10.1 EER	
Heating Cap [kBtu/h]	145.677	204.915	
Heating Efficiency	90% AFUE	80% AFUE	
Design Airflow [cfm]	2834	2834	
Fan Demand [kW]	2.230	2.104	
TSP [in. w.g.]	3.5	3.5	
Economizer	Yes, OA drybulb control	None	
Heat recovery	Dedicated, stand-alone total enthalpy wheel: 76% sensible eff., 74% latent eff.	None	

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
Envelope			
Wall Assembly	R-21+7.5ci wall Gross Area: 5833 sf Net Area: 3617 sf	R-13	
Roof Assembly	R-40; Insulation entirely above deck; Absorptance = 0.7 Gross Area: 10000 sf	R-15; Insulation entirely above deck; Absorptance = 0.7	
Window Assembly	Solarban 80 w/ thermally broken aluminum frame: U-0.41; SHGC-0.24; VLT-0.407 Gross Area: 2216 sf	Generic glazing: U-0.57; SHGC-0.39	
Interior Loads			
Lighting	LPD= 0.8 W/sf (T-5 lamps)	LPD= 1.0 W/sf (T-8 lamps)	
Daylighting Controls	None	None	
HVAC Systems	Split system with dedicated ERV (independent fans); 90% eff. furnace	Packaged Single Zone Rooftop Units	
System 1	***EL1 Sys1 PVVT (G.S1)***	***EL1 Sys1 PSV (G.S1)***	
Cooling Cap [kBtu/h] (Tons)	54.446 (4.5)	83.420 (7.0)	
Cooling Efficiency	11.5 EER	10.1 EER	
Heating Cap [kBtu/h]	98.903	161.116	
Heating Efficiency	90% AFUE	80% AFUE	
Design Airflow [cfm]	2067	2994	
Fan Demand [kW]	1.529	2.090	
TSP [in. w.g.]	3.5	3.5	
Economizer	Yes, OA drybulb control	None	
Heat recovery	Dedicated, stand-alone total enthalpy wheel: 76% sensible eff., 74% latent eff.	None	
System 2	***EL1 Sys1 PVVT (G.E2)***	***EL1 Sys1 PSV (G.E2)***	
Cooling Cap [kBtu/h] (Tons)	28.622 (2.4)	43.761 (3.6)	
Cooling Efficiency	14 SEER	12 SEER	
Heating Cap [kBtu/h]	52.269	83.704	
Heating Efficiency	90% AFUE	80% AFUE	
Design Airflow [cfm]	1067	1549	
Fan Demand [kW]	0.813	1.117	
TSP [in. w.g.]	3.6	3.7	
Economizer	Yes, OA drybulb control	None	
Heat recovery	Dedicated, stand-alone total enthalpy wheel: 76% sensible eff., 74% latent eff.	None	

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
System 3	***EL1 Sys1 PVVT (G.N3)***	***EL1 Sys1 PSV (G.N3)***	
Cooling Cap [kBtu/h] (Tons)	32.756 (2.7)	47.213 (3.9)	
Cooling Efficiency	14 SEER	12 SEER	
Heating Cap [kBtu/h]	62.156	96.724	
Heating Efficiency	90% AFUE	80% AFUE	
Design Airflow [cfm]	1186	1509	
Fan Demand [kW]	0.903	1.084	
TSP [in. w.g.]	3.6	3.6	
Economizer	Yes, OA drybulb control	None	
Heat recovery	Dedicated, stand-alone total enthalpy wheel: 76% sensible eff., 74% latent eff.	None	
System 4	***EL1 Sys1 PVVT (G.W4)***	***EL1 Sys1 PSV (G.W4)***	
Cooling Cap [kBtu/h] (Tons)	30.926 (2.6)	45.914 (3.8)	
Cooling Efficiency	14 SEER	12 SEER	
Heating Cap [kBtu/h]	57.575	89.123	
Heating Efficiency	90% AFUE	80% AFUE	
Design Airflow [cfm]	1189	1676	
Fan Demand [kW]	0.907	1.205	
TSP [in. w.g.]	3.6	3.6	
Economizer	Yes, OA drybulb control	None	
Heat recovery	Dedicated, stand-alone total enthalpy wheel: 76% sensible eff., 74% latent eff.	None	
System 5	***EL1 Sys1 PVVT (G.C5)***	***EL1 Sys1 PSV (G.C5)***	
Cooling Cap [kBtu/h] (Tons)	82.276 (6.9)	97.284 (8.1)	
Cooling Efficiency	11.5 EER	10.1 EER	
Heating Cap [kBtu/h]	142.696	193.881	
Heating Efficiency	90% AFUE	80% AFUE	
Design Airflow [cfm]	3021	3021	
Fan Demand [kW]	2.230	2.104	
TSP [in. w.g.]	3.5	3.5	
Economizer	Yes, OA drybulb control	None	
Heat recovery	Dedicated, stand-alone total enthalpy wheel: 76% sensible eff., 74% latent eff.	None	

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
Envelope			
Wall Assembly	R-21+7.5ci wall Gross Area: 5834 sf Net Area:4784 sf	R-13	
Roof Assembly	R-40; Insulation entirely above deck; Absorptance = 0.7 Gross Area: 10000 sf	R-15; Insulation entirely above deck; Absorptance = 0.7	
Window Assembly	Solarban 80 w/ thermally broken aluminum frame: U-0.42; SHGC-0.27; VLT-0.543 Gross Area:1050 sf	Generic glazing: U-0.57; SHGC-0.39	
Interior Loads			
Lighting	LPD= 0.8 W/sf (T-5 lamps)	LPD= 1.0 W/sf (T-8 lamps)	
Daylighting Controls	None	None	
HVAC Systems	Split system with dedicated ERV (independent fans); 90% eff. furnace	Packaged Single Zone Rooftop Units	
System 1	***EL1 Sys1 PVVT (G.S1)***	***EL1 Sys1 PSV (G.S1)***	
Cooling Cap [kBtu/h] (Tons)	42.574 (3.5)	64.036 (4.7)	
Cooling Efficiency	11.5 EER	10.1 EER	
Heating Cap [kBtu/h]	74.902	114.317	
Heating Efficiency	90% AFUE	80% AFUE	
Design Airflow [cfm]	1344	1706	
Fan Demand [kW]	1.081	1.294	
TSP [in. w.g.]	3.5	3.5	
Economizer	Yes, OA drybulb control	None	
Heat recovery	Dedicated, stand-alone total enthalpy wheel: 76% sensible eff., 74% latent eff.	None	
System 2	***EL1 Sys1 PVVT (G.E2)***	***EL1 Sys1 PSV (G.E2)***	
Cooling Cap [kBtu/h] (Tons)	23.285 (1.9)	33.852 (2.8)	
Cooling Efficiency	14 SEER	12 SEER	
Heating Cap [kBtu/h]	40.765	60.165	
Heating Efficiency	90% AFUE	80% AFUE	
Design Airflow [cfm]	717	895	
Fan Demand [kW]	0.594	0.701	
TSP [in. w.g.]	3.6	3.7	
Economizer	Yes, OA drybulb control	None	
Heat recovery	Dedicated, stand-alone total enthalpy wheel: 76% sensible eff., 74% latent eff.	None	

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
System 3	***EL1 Sys1 PVVT (G.N3)***	***EL1 Sys1 PSV (G.N3)***	
Cooling Cap [kBtu/h] (Tons)	35.229 (2.9)	49.139 (4.1)	
Cooling Efficiency	14 SEER	12 SEER	
Heating Cap [kBtu/h]	62.713	89.566	
Heating Efficiency	90% AFUE	80% AFUE	
Design Airflow [cfm]	1061	1186	
Fan Demand [kW]	0.878	0.925	
TSP [in. w.g.]	3.6	3.6	
Economizer	Yes, OA drybulb control	None	
Heat recovery	Dedicated, stand-alone total enthalpy wheel: 76% sensible eff., 74% latent eff.	None	
System 4	***EL1 Sys1 PVVT (G.W4)***	***EL1 Sys1 PSV (G.W4)***	
Cooling Cap [kBtu/h] (Tons)	24.541 (2.0)	35.029 (2.9)	
Cooling Efficiency	14 SEER	12 SEER	
Heating Cap [kBtu/h]	42.986	62.723	
Heating Efficiency	90% AFUE	80% AFUE	
Design Airflow [cfm]	765	950	
Fan Demand [kW]	0.633	0.743	
TSP [in. w.g.]	3.6	3.6	
Economizer	Yes, OA drybulb control	None	
Heat recovery	Dedicated, stand-alone total enthalpy wheel: 76% sensible eff., 74% latent eff.	None	
System 5	***EL1 Sys1 PVVT (G.C5)***	***EL1 Sys1 PSV (G.C5)***	
Cooling Cap [kBtu/h] (Tons)	82.516 (6.9)	112.161 (9.3)	
Cooling Efficiency	11.5 EER	10.1 EER	
Heating Cap [kBtu/h]	144.938	197.207	
Heating Efficiency	90% AFUE	80% AFUE	
Design Airflow [cfm]	2781	2781	
Fan Demand [kW]	2.230	2.104	
TSP [in. w.g.]	3.5	3.5	
Economizer	Yes, OA drybulb control	None	
Heat recovery	Dedicated, stand-alone total enthalpy wheel: 76% sensible eff., 74% latent eff.	None	

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
Envelope			
Wall Assembly	R-21+7.5ci wall Gross Area: 5834 sf Net Area:4784 sf	R-13	
Roof Assembly	R-40; Insulation entirely above deck; Absorptance = 0.7 Gross Area: 10000 sf	R-15; Insulation entirely above deck; Absorptance = 0.7	
Window Assembly	Solarban 70XL Starphire w/ thermally broken alum frame: U-0.42; SHGC-0.27; VLT-0.543 Gross Area:1050 sf	Generic glazing: U-0.57; SHGC-0.39	
Interior Loads			
Lighting	LPD= 0.8 W/sf (T-5 lamps)	LPD= 1.0 W/sf (T-8 lamps)	
Daylighting Controls	None	None	
HVAC Systems	Split system with dedicated ERV (independent fans); 90% eff. furnace	Packaged Single Zone Rooftop Units	
System 1	***EL1 Sys1 PVVT (G.S1)***	***EL1 Sys1 PSV (G.S1)***	
Cooling Cap [kBtu/h] (Tons)	41.833 (3.5)	59.413 (5.0)	
Cooling Efficiency	11.5 EER	10.1 EER	
Heating Cap [kBtu/h]	74.524	117.082	
Heating Efficiency	90% AFUE	80% AFUE	
Design Airflow [cfm]	1355	1732	
Fan Demand [kW]	1.069	1.289	
TSP [in. w.g.]	3.5	3.5	
Economizer	Yes, OA drybulb control	None	
Heat recovery	Dedicated, stand-alone total enthalpy wheel: 76% sensible eff., 74% latent eff.	None	
System 2	***EL1 Sys1 PVVT (G.E2)***	***EL1 Sys1 PSV (G.E2)***	
Cooling Cap [kBtu/h] (Tons)	23.560 (2.0)	32.738 (2.7)	
Cooling Efficiency	14 SEER	12 SEER	
Heating Cap [kBtu/h]	42.432	64.333	
Heating Efficiency	90% AFUE	80% AFUE	
Design Airflow [cfm]	760	967	
Fan Demand [kW]	0.618	0.743	
TSP [in. w.g.]	3.6	3.7	
Economizer	Yes, OA drybulb control	None	
Heat recovery	Dedicated, stand-alone total enthalpy wheel: 76% sensible eff., 74% latent eff.	None	

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
System 3	***EL1 Sys1 PVVT (G.N3)***	***EL1 Sys1 PSV (G.N3)***	
Cooling Cap [kBtu/h] (Tons)	34.568 (2.9)	44.407 (3.7)	
Cooling Efficiency	14 SEER	12 SEER	
Heating Cap [kBtu/h]	63.277	92.609	
Heating Efficiency	90% AFUE	80% AFUE	
Design Airflow [cfm]	1082	1203	
Fan Demand [kW]	0.878	0.921	
TSP [in. w.g.]	3.6	3.6	
Economizer	Yes, OA drybulb control	None	
Heat recovery	Dedicated, stand-alone total enthalpy wheel: 76% sensible eff., 74% latent eff.	None	
System 4	***EL1 Sys1 PVVT (G.W4)***	***EL1 Sys1 PSV (G.W4)***	
Cooling Cap [kBtu/h] (Tons)	23.911 (2.0)	32.475 (2.7)	
Cooling Efficiency	14 SEER	12 SEER	
Heating Cap [kBtu/h]	42.565	63.660	
Heating Efficiency	90% AFUE	80% AFUE	
Design Airflow [cfm]	763	953	
Fan Demand [kW]	0.620	0.731	
TSP [in. w.g.]	3.6	3.6	
Economizer	Yes, OA drybulb control	None	
Heat recovery	Dedicated, stand-alone total enthalpy wheel: 76% sensible eff., 74% latent eff.	None	
System 5	***EL1 Sys1 PVVT (G.C5)***	***EL1 Sys1 PSV (G.C5)***	
Cooling Cap [kBtu/h] (Tons)	83.704 (7.0)	103.139 (8.6)	
Cooling Efficiency	11.5 EER	10.1 EER	
Heating Cap [kBtu/h]	145.677	204.915	
Heating Efficiency	90% AFUE	80% AFUE	
Design Airflow [cfm]	2834	2834	
Fan Demand [kW]	2.230	2.104	
TSP [in. w.g.]	3.5	3.5	
Economizer	Yes, OA drybulb control	None	
Heat recovery	Dedicated, stand-alone total enthalpy wheel: 76% sensible eff., 74% latent eff.	None	

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
Envelope			
Wall Assembly	R-21+7.5ci wall Gross Area: 5834 sf Net Area:4784 sf	R-13	
Roof Assembly	R-40; Insulation entirely above deck; Absorptance = 0.7 Gross Area: 10000 sf	R-15; Insulation entirely above deck; Absorptance = 0.7	
Window Assembly	Solarban 70XL Starphire w/ thermally broken alum frame: U-0.42; SHGC-0.27; VLT-0.543 Gross Area:1050 sf	Generic glazing: U-0.57; SHGC-0.39	
Interior Loads			
Lighting	LPD= 0.8 W/sf (T-5 lamps)	LPD= 1.0 W/sf (T-8 lamps)	
Daylighting Controls	None	None	
HVAC Systems	Split system with dedicated ERV (independent fans); 90% eff. furnace	Packaged Single Zone Rooftop Units	
System 1	***EL1 Sys1 PVVT (G.S1)***	***EL1 Sys1 PSV (G.S1)***	
Cooling Cap [kBtu/h] (Tons)	41.322 (3.5)	57.640 (4.8)	
Cooling Efficiency	11.5 EER	10.1 EER	
Heating Cap [kBtu/h]	74.123	113.249	
Heating Efficiency	90% AFUE	80% AFUE	
Design Airflow [cfm]	1491	1892	
Fan Demand [kW]	1.103	1.321	
TSP [in. w.g.]	3.5	3.5	
Economizer	Yes, OA drybulb control	None	
Heat recovery	Dedicated, stand-alone total enthalpy wheel: 76% sensible eff., 74% latent eff.	None	
System 2	***EL1 Sys1 PVVT (G.E2)***	***EL1 Sys1 PSV (G.E2)***	
Cooling Cap [kBtu/h] (Tons)	20.917 (2.0)	29.695 (2.5)	
Cooling Efficiency	14 SEER	12 SEER	
Heating Cap [kBtu/h]	38.514	57.795	
Heating Efficiency	90% AFUE	80% AFUE	
Design Airflow [cfm]	753	952	
Fan Demand [kW]	0.574	0.686	
TSP [in. w.g.]	3.6	3.7	
Economizer	Yes, OA drybulb control	None	
Heat recovery	Dedicated, stand-alone total enthalpy wheel: 76% sensible eff., 74% latent eff.	None	

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
System 3	***EL1 Sys1 PVVT (G.N3)***	***EL1 Sys1 PSV (G.N3)***	
Cooling Cap [kBtu/h] (Tons)	31.976 (2.9)	39.004 (3.3)	
Cooling Efficiency	14 SEER	12 SEER	
Heating Cap [kBtu/h]	60.713	81.391	
Heating Efficiency	90% AFUE	80% AFUE	
Design Airflow [cfm]	1153	1161	
Fan Demand [kW]	0.878	0.833	
TSP [in. w.g.]	3.6	3.6	
Economizer	Yes, OA drybulb control	None	
Heat recovery	Dedicated, stand-alone total enthalpy wheel: 76% sensible eff., 74% latent eff.	None	
System 4	***EL1 Sys1 PVVT (G.W4)***	***EL1 Sys1 PSV (G.W4)***	
Cooling Cap [kBtu/h] (Tons)	22.847 (2.0)	31.730 (2.6)	
Cooling Efficiency	14 SEER	12 SEER	
Heating Cap [kBtu/h]	42.614	62.853	
Heating Efficiency	90% AFUE	80% AFUE	
Design Airflow [cfm]	848	1070	
Fan Demand [kW]	0.647	0.770	
TSP [in. w.g.]	3.6	3.6	
Economizer	Yes, OA drybulb control	None	
Heat recovery	Dedicated, stand-alone total enthalpy wheel: 76% sensible eff., 74% latent eff.	None	
System 5	***EL1 Sys1 PVVT (G.C5)***	***EL1 Sys1 PSV (G.C5)***	
Cooling Cap [kBtu/h] (Tons)	82.276 (7.0)	98.225 (8.2)	
Cooling Efficiency	11.5 EER	10.1 EER	
Heating Cap [kBtu/h]	142.696	193.881	
Heating Efficiency	90% AFUE	80% AFUE	
Design Airflow [cfm]	3021	3021	
Fan Demand [kW]	2.230	2.104	
TSP [in. w.g.]	3.5	3.5	
Economizer	Yes, OA drybulb control	None	
Heat recovery	Dedicated, stand-alone total enthalpy wheel: 76% sensible eff., 74% latent eff.	None	

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
Envelope			
Wall	R-21 + R-7.5 ci U-Value = 0.059 Gross Area: 21600 sf Net Area: 17712 sf	R-13 + R-3.8 ci U-Value = 0.084	
Roof	R-40 Entirely above deck U-Value = 0.025 Gross Area: 20000 sf	R-15 Entirely above deck U-Value = 0.063	
Window	Solarban 70XL Starphire w/ thermally broken aluminum frame. U-Value = 0.57 SHGC = 0.261 Gross Area: 3888 sf	ASHRAE Standard 90.1 minimum required assembly U-Value U-Value = 0.57 SHGC = 0.49	
Interior Loads			
Lighting	1.5 W/ft^2	1.5 W/ft^2	
Daylighting Controls	None	None	
HVAC Systems	Split system DX w/ residential type gas furnace	Packaged Single Zone Rooftop Units	
System 1			
Cooling Cap [kBtu/h] (tons)	30.923 (2.58)	37.507 (3.13)	
Cooling Efficiency	14 SEER	12 SEER	
Heating Cap [kBtu/h]	54.159	72.242	
Heating Efficiency	90%	80%	
Design Airflow [cfm]	645	721	
Fan Demand [kW]	0.532	0.595	
Economizer	Drybulb	None	
Heat recovery	None	None	
System 2			
Cooling Cap [kBtu/h] (tons)	59.185* (4.93)	73.172 (6.10)	*Split load between two units
Cooling Efficiency	14 SEER	10.1 EER	
Heating Cap [kBtu/h]	100.838	137.084	
Heating Efficiency	90%	80%	
Design Airflow [cfm]	1265	1448	
Fan Demand [kW]	1.001	1.146	
Economizer	Drybulb	None	
Heat recovery	None	None	

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
System 3			
Cooling Cap [kBtu/h] (tons)	15.921 (1.33)	21.190 (1.77)	
Cooling Efficiency	14 SEER	12 SEER	
Heating Cap [kBtu/h]	26.517	38.921	
Heating Efficiency	90%	80%	
Design Airflow [cfm]	370	465	
Fan Demand [kW]	0.312	0.392	
Economizer	Drybulb	None	
Heat recovery	None	None	
System 4			
Cooling Cap [kBtu/h] (tons)	64.166* (5.35)	81.563 (6.80)	*Split load between two units
Cooling Efficiency	14.0 SEER	10.1 EER	
Heating Cap [kBtu/h]	108.437	151.944	
Heating Efficiency	90%	80%	
Design Airflow [cfm]	1422	1693	
Fan Demand [kW]	1.110	1.322	
Economizer	Drybulb	None	
Heat recovery	None	None	
System 5			
Cooling Cap [kBtu/h] (tons)	15.203 (1.27)	19.471 (1.62)	
Cooling Efficiency	14.0 SEER	12.0 SEER	
Heating Cap [kBtu/h]	25.142	35.581	
Heating Efficiency	90%	80%	
Design Airflow [cfm]	344	412	
Fan Demand [kW]	0.293	0.352	
Economizer	Drybulb	None	
Heat recovery	None	None	

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
Envelope			
Wall	R-21 + R-7.5 ci U-Value = 0.059 Gross Area: 21600 sf Net Area: 17712 sf	R-13 + R-3.8 ci U-Value = 0.084	
Roof	R-40 Entirely above deck U-Value = 0.025 Gross Area: 20000 sf	R-15 Entirely above deck U-Value = 0.063	
Window	Solarban 70XL Starphire w/ thermally broken aluminum frame. U-Value = 0.57 SHGC = 0.261 Gross Area: 3888 sf	ASHRAE Standard 90.1 minimum required assembly U-Value U-Value = 0.57 SHGC = 0.49	
Interior Loads			
Lighting	1.5 W/ft^2	1.5 W/ft^2	
Daylighting Controls	None	None	
HVAC Systems	Split system DX w/ residential type gas furnace	Packaged Single Zone Rooftop Units	
System 1			
Cooling Cap [kBtu/h] (tons)	27.942 (2.33)	34.226 (2.85)	
Cooling Efficiency	14 SEER	12 SEER	
Heating Cap [kBtu/h]	57.143	76.249	
Heating Efficiency	90%	80%	
Design Airflow [cfm]	661	745	
Fan Demand [kW]	0.535	0.603	
Economizer	Drybulb	None	
Heat recovery	None	None	
System 2			
Cooling Cap [kBtu/h] (tons)	52.873* (4.4)	65.792 (5.48)	*Split load between two units
Cooling Efficiency	14 SEER	10.1 EER	
Heating Cap [kBtu/h]	105.451	142.937	
Heating Efficiency	90%	80%	
Design Airflow [cfm]	1286	1477	
Fan Demand [kW]	0.999	1.147	
Economizer	Drybulb	None	
Heat recovery	None	None	

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
System 3			
Cooling Cap [kBtu/h] (tons)	14.326 (1.19)	19.511 (1.63)	
Cooling Efficiency	14 SEER	12 SEER	
Heating Cap [kBtu/h]	27.363	40.407	
Heating Efficiency	90%	80%	
Design Airflow [cfm]	374	478	
Fan Demand [kW]	0.309	0.396	
Economizer	Drybulb	None	
Heat recovery	None	None	
System 4			
Cooling Cap [kBtu/h] (tons)	56.058* (4.67)	71.632 (5.97)	*Split load between two units
Cooling Efficiency	14.0 SEER	10.1 EER	
Heating Cap [kBtu/h]	110.724	153.775	
Heating Efficiency	90%	80%	
Design Airflow [cfm]	1398	1660	
Fan Demand [kW]	1.071	1.271	
Economizer	Drybulb	None	
Heat recovery	None	None	
System 5			
Cooling Cap [kBtu/h] (tons)	13.550 (1.13)	17.594 (1.47)	
Cooling Efficiency	14.0 SEER	12.0 SEER	
Heating Cap [kBtu/h]	25.919	36.655	
Heating Efficiency	90%	80%	
Design Airflow [cfm]	346	418	
Fan Demand [kW]	0.289	0.350	
Economizer	Drybulb	None	
Heat recovery	None	None	

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
Envelope			
Wall	R-21 + R-7.5 ci U-Value = 0.059 Gross Area: 21600 sf Net Area: 17712 sf	R-13 + R-3.8 ci U-Value = 0.084	
Roof	R-40 Entirely above deck U-Value = 0.025 Gross Area: 20000 sf	R-15 Entirely above deck U-Value = 0.063	
Window	Solarban 70XL Starphire w/ thermally broken aluminum frame. U-Value = 0.57 SHGC = 0.261 Gross Area: 3888 sf	ASHRAE Standard 90.1 minimum required assembly U-Value U-Value = 0.57 SHGC = 0.49	
Interior Loads			
Lighting	1.5 W/ft^2	1.5 W/ft^2	
Daylighting Controls	None	None	
HVAC Systems	Split system DX w/ residential type gas furnace	Packaged Single Zone Rooftop Units	
System 1			
Cooling Cap [kBtu/h] (tons)	22.800 (1.90)	29.108 (2.43)	
Cooling Efficiency	14 SEER	12 SEER	
Heating Cap [kBtu/h]	54.721	73.606	
Heating Efficiency	90%	80%	
Design Airflow [cfm]	707	803	
Fan Demand [kW]	0.537	0.609	
Economizer	Drybulb	None	
Heat recovery	None	None	
System 2			
Cooling Cap [kBtu/h] (tons)	40.954 (3.41)	53.141 (4.43)	
Cooling Efficiency	14 SEER	12 SEER	
Heating Cap [kBtu/h]	97.598	133.086	
Heating Efficiency	90%	80%	
Design Airflow [cfm]	1289	1492	
Fan Demand [kW]	0.939	1.087	
Economizer	Drybulb	None	
Heat recovery	None	None	

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
System 3			
Cooling Cap [kBtu/h] (tons)	12.071 (1.00)	17.444 (1.45)	
Cooling Efficiency	14 SEER	12 SEER	
Heating Cap [kBtu/h]	26.690	40.086	
Heating Efficiency	90%	80%	
Design Airflow [cfm]	404	525	
Fan Demand [kW]	0.314	0.408	
Economizer	Drybulb	None	
Heat recovery	None	None	
System 4			
Cooling Cap [kBtu/h] (tons)	46.883 (3.91)	63.916 (5.33)	
Cooling Efficiency	14.0 SEER	12.0 SEER	
Heating Cap [kBtu/h]	108.163	154.023	
Heating Efficiency	90%	80%	
Design Airflow [cfm]	1530	1870	
Fan Demand [kW]	1.099	1.344	
Economizer	Drybulb	None	
Heat recovery	None	None	
System 5			
Cooling Cap [kBtu/h] (tons)	10.8 (0.90)	14.749 (1.23)	
Cooling Efficiency	14.0 SEER	12.0 SEER	
Heating Cap [kBtu/h]	24.354	34.777	
Heating Efficiency	90%	80%	
Design Airflow [cfm]	354	432	
Fan Demand [kW]	0.278	0.340	
Economizer	Drybulb	None	
Heat recovery	None	None	

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
Envelope			
Wall Assembly	R-13 + 10 ci U-Value = 0.055 Gross Area: 7140 sf Net Area: 5520 sf	R-13 + R-3.8 ci U-Value = 0.084	
Roof Assembly	Same as baseline Gross Area: 13500sf	R-15 Entirely above deck U-Value = 0.063	
Window Assembly	Solarban 70XL w/ thermally broken frame U-Value = 0.37 SHGC = 0.27 VT = 0.57 Gross Area: 1620 sf	Generic glazing: U-Value = 0.57 SHGC = 0.49 VT = 0.81	
Interior Loads			
Lighting	Same as baseline	1.5 W/ft^2	T-8 lamps for both
Daylighting Controls	None	None	
HVAC Systems	DX Split System Furnace	Packaged Single Zone Rooftop Units	
System 1	***EL1 Sys1 PSZ (G.W1)***	***EL1 Sys1 PSZ (G.W1)***	
Cooling Cap [kBtu/h] (tons)	35.490 (2.96)	59.366 (4.95)	
Cooling Efficiency	14 SEER	12 SEER	
Heating Cap [kBtu/h]	58.342	105.321	
Heating Efficiency	90%	80%	
Design Airflow [cfm]	813	1385	
Fan Demand [kW] (bhp)	0.843 (1.00)	1.499 (2.03)	
TSP [in. w.g.]	5.1	5.1	
Economizer	Yes, drybulb	None	
Heat recovery	Total Energy Wheel	None	
System 2	***EL1 Sys1 PSZ (G.C2)***	***EL1 Sys1 PSZ (G.C2)***	
Cooling Cap [kBtu/h] (tons)	25.687 (2.14)	29.757 (2.47)	
Cooling Efficiency	14 SEER	12 SEER	
Heating Cap [kBtu/h]	42.918	53.525	
Heating Efficiency	90%	80%	
Design Airflow [cfm]	593	593	
Fan Demand [kW] (bhp)	0.637 (0.86)	.665 (0.90)	
TSP [in. w.g.]	5.2	5.2	
Economizer	Yes, drybulb	None	

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
Heat recovery	Total Energy Wheel	None	
System 3	***EL1 Sys1 PSZ (G.N3)***	***EL1 Sys1 PSZ (G.N3)***	
Cooling Cap [kBtu/h] (tons)	14.899 (1.24)	19.846 (1.65)	
Cooling Efficiency	14 SEER	12 SEER	
Heating Cap [kBtu/h]	24.224	34.616	
Heating Efficiency	90%	80%	
Design Airflow [cfm]	359	436	
Fan Demand [kW] (bhp)	0.395 (0.53)	0.502 (0.68)	
TSP [in. w.g.]	5.4	5.4	
Economizer	Yes, drybulb	None	
Heat recovery	Total Energy Wheel	None	
System 4	***EL1 Sys1 PSZ (G.S4)***	***EL1 Sys1 PSZ (G.S4)***	
Cooling Cap [kBtu/h] (tons)	18.771 (1.56)	25.483 (2.12)	
Cooling Efficiency	14 SEER	12 SEER	
Heating Cap [kBtu/h]	30.750	45.007	
Heating Efficiency	90%	80%	
Design Airflow [cfm]	501	618	
Fan Demand [kW] (bhp)	0.541 (0.73)	0.696 (0.94)	
TSP [in. w.g.]	5.3	5.3	
Economizer	Yes, drybulb	None	
Heat recovery	Total Energy Wheel	None	
System 5	***EL1 Sys1 PSZ (G.N5)***	***EL1 Sys1 PSZ (G.W1)***	
Cooling Cap [kBtu/h] (tons)	19.100 (1.59)	24.638 (2.05)	
Cooling Efficiency	14 SEER	12 SEER	
Heating Cap [kBtu/h]	31.196	43.316	
Heating Efficiency	90%	80%	
Design Airflow [cfm]	453	531	
Fan Demand [kW] (bhp)	0.492 (0.66)	0.602 (0.81)	
TSP [in. w.g.]	5.3	5.3	
Economizer	Yes, drybulb	None	
Heat recovery	Total Energy Wheel	None	
System 6	***EL1 Sys1 PSZ (G.C6)***	***EL1 Sys1 PSZ (G.C6)***	
Cooling Cap [kBtu/h] (tons)	50.498 (4.21)	58.491 (4.87)	
Cooling Efficiency	14 SEER	12 SEER	
Heating Cap [kBtu/h]	84.834	105.812	
Heating Efficiency	90%	80%	

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
Design Airflow [cfm]	1161	1161	
Fan Demand [kW] (bhp)	1.2 (1.62)	1.253 (1.69)	
TSP [in. w.g.]	5.0	5.0	
Economizer	Yes, drybulb	None	
Heat recovery	Total Energy Wheel	None	
System 7	***EL1 Sys1 PSZ (G.S7)***	***EL1 Sys1 PSZ (G.S7)***	
Cooling Cap [kBtu/h] (tons)	22.958 (1.91)	30.362 (2.53)	
Cooling Efficiency	14 SEER	12 SEER	
Heating Cap [kBtu/h]	37.719	53.691	
Heating Efficiency	90%	80%	
Design Airflow [cfm]	596	713	
Fan Demand [kW] (bhp)	0.638 (0.86)	0.797 (1.08)	
TSP [in. w.g.]	5.2	5.2	
Economizer	Yes, drybulb	None	
Heat recovery	Total Energy Wheel	None	
System 8	***EL1 Sys1 PSZ (G.N8)***	***EL1 Sys1 PSZ (G.N8)***	
Cooling Cap [kBtu/h] (tons)	19.100 (1.59)	24.638 (2.05)	
Cooling Efficiency	14 SEER	12 SEER	
Heating Cap [kBtu/h]	31.197	43.316	
Heating Efficiency	90%	80%	
Design Airflow [cfm]	453	531	
Fan Demand [kW] (bhp)	0.492 (0.66)	0.602 (0.81)	
TSP [in. w.g.]	5.3	5.3	
Economizer	Yes, drybulb	None	
Heat recovery	Total Energy Wheel	None	
System 9	***EL1 Sys1 PSZ (G.C9)***	***EL1 Sys1 PSZ (G.C9)***	
Cooling Cap [kBtu/h] (tons)	50.498 (4.21)	58.491 (4.87)	
Cooling Efficiency	14 SEER	12 SEER	
Heating Cap [kBtu/h]	84.834	105.812	
Heating Efficiency	90%	80%	
Design Airflow [cfm]	1161	1161	
Fan Demand [kW] (bhp)	1.2 (1.62)	1.253 (1.69)	
TSP [in. w.g.]	5.0	5.0	
Economizer	Yes, drybulb	None	
Heat recovery	Total Energy Wheel	None	

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
System 10	***EL1 Sys1 PSZ (G.S10)***	***EL1 Sys1 PSZ (G.S10)***	
Cooling Cap [kBtu/h] (tons)	22.958 (1.91)	30.362 (2.53)	
Cooling Efficiency	14 SEER	12 SEER	
Heating Cap [kBtu/h]	37.719	53.691	
Heating Efficiency	90%	80%	
Design Airflow [cfm]	596	713	
Fan Demand [kW] (bhp)	0.638 (0.86)	0.797 (1.08)	
TSP [in. w.g.]	5.2	5.2	
Economizer	Yes, drybulb	None	
Heat recovery	Total Energy Wheel	None	
System 11	***EL1 Sys1 PSZ (G.N11)***	***EL1 Sys1 PSZ (G.N11)***	
Cooling Cap [kBtu/h] (tons)	19.351 (1.61)	24.911 (2.08)	
Cooling Efficiency	14 SEER	12 SEER	
Heating Cap [kBtu/h]	31.376	43.527	
Heating Efficiency	90%	80%	
Design Airflow [cfm]	457	535	
Fan Demand [kW] (bhp)	0.496 (0.67)	0.606 (0.82)	
TSP [in. w.g.]	5.3	5.3	
Economizer	Yes, drybulb	None	
Heat recovery	Total Energy Wheel	None	
System 12	***EL1 Sys1 PSZ (G.C12)***	***EL1 Sys1 PSZ (G.C12)***	
Cooling Cap [kBtu/h] (tons)	51.232 (4.27)	59.341 (4.95)	
Cooling Efficiency	14 SEER	12 SEER	
Heating Cap [kBtu/h]	85.375	106.486	
Heating Efficiency	90%	80%	
Design Airflow [cfm]	1173	1173	
Fan Demand [kW] (bhp)	1.213 (1.64)	1.266 (1.71)	
TSP [in. w.g.]	5.0	5.0	
Economizer	Yes, drybulb	None	
Heat recovery	Total Energy Wheel	None	
System 13	***EL1 Sys1 PSZ (G.S13)***	***EL1 Sys1 PSZ (G.S13)***	
Cooling Cap [kBtu/h] (tons)	23.219 (1.94)	30.675 (2.56)	
Cooling Efficiency	14 SEER	12 SEER	
Heating Cap [kBtu/h]	37.895	53.913	
Heating Efficiency	90%	80%	
Design Airflow [cfm]	600	716	

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
Fan Demand [kW] (bhp)	0.641 (0.87)	0.800 (1.08)	
TSP [in. w.g.]	5.2	5.2	
Economizer	Yes, drybulb	None	
Heat recovery	Total Energy Wheel	None	
System 14	***EL1 Sys1 PSZ (G.N14)***	***EL1 Sys1 PSZ (G.N14)***	
Cooling Cap [kBtu/h] (tons)	19.100 (1.59)	24.638 (2.05)	
Cooling Efficiency	14 SEER	12 SEER	
Heating Cap [kBtu/h]	31.197	43.316	
Heating Efficiency	90%	80%	
Design Airflow [cfm]	453	531	
Fan Demand [kW] (bhp)	0.492 (0.66)	0.602 (0.81)	
TSP [in. w.g.]	5.3	5.3	
Economizer	Yes, drybulb	None	
Heat recovery	Total Energy Wheel	None	
System 15	***EL1 Sys1 PSZ (G.C15)***	***EL1 Sys1 PSZ (G.C15)***	
Cooling Cap [kBtu/h] (tons)	50.498 (4.21)	58.491 (4.87)	
Cooling Efficiency	14 SEER	12 SEER	
Heating Cap [kBtu/h]	84.834	105.812	
Heating Efficiency	90%	80%	
Design Airflow [cfm]	1161	1161	
Fan Demand [kW] (bhp)	1.2 (1.62)	1.253 (1.69)	
TSP [in. w.g.]	5.0	5.0	
Economizer	Yes, drybulb	None	
Heat recovery	Total Energy Wheel	None	
System 16	***EL1 Sys1 PSZ (G.S16)***	***EL1 Sys1 PSZ (G.S16)***	
Cooling Cap [kBtu/h] (tons)	22.958 (1.91)	30.362 (2.31)	
Cooling Efficiency	14 SEER	12 SEER	
Heating Cap [kBtu/h]	37.719	53.691	
Heating Efficiency	90%	80%	
Design Airflow [cfm]	596	713	
Fan Demand [kW] (bhp)	0.638 (0.86)	0.797 (1.08)	
TSP [in. w.g.]	5.2	5.2	
Economizer	Yes, drybulb	None	
Heat recovery	Total Energy Wheel	None	

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
System 17	***EL1 Sys1 PSZ (G.C17)***	***EL1 Sys1 PSZ (G.C17)***	
Cooling Cap [kBtu/h] (tons)	59.523 (4.96)	68.921 (5.71)	
Cooling Efficiency	14 SEER	10.1 EER	
Heating Cap [kBtu/h]	112.461	140.367	
Heating Efficiency	90%	80%	
Design Airflow [cfm]	982	982	
Fan Demand [kW] (bhp)	1.023 (1.38)	1.068 (1.44)	
TSP [in. w.g.]	5.1	5.1	
Economizer	Yes, drybulb	None	
Heat recovery	Total Energy Wheel	None	
System 18	***EL1 Sys1 PSZ (G.N18)***	***EL1 Sys1 PSZ (G.N18)***	
Cooling Cap [kBtu/h] (tons)	31.838 (2.65)	39.431 (3.29)	
Cooling Efficiency	14 SEER	12 SEER	
Heating Cap [kBtu/h]	58.089	75.367	
Heating Efficiency	90%	80%	
Design Airflow [cfm]	540	597	
Fan Demand [kW] (bhp)	0.580 (0.78)	0.670 (0.91)	
TSP [in. w.g.]	5.2	5.2	
Economizer	Yes, drybulb	None	
Heat recovery	Total Energy Wheel	None	
System 19	***EL1 Sys1 PSZ (G.E19)***	***EL1 Sys1 PSZ (G.E19)***	
Cooling Cap [kBtu/h] (tons)	79.854 (6.65)	111.085 (9.26)	
Cooling Efficiency	14 SEER	10.1 EER	
Heating Cap [kBtu/h]	150.422	208.787	
Heating Efficiency	90%	80%	
Design Airflow [cfm]	1319	1734	
Fan Demand [kW] (bhp)	1.348 (1.82)	1.850 (2.5)	
TSP [in. w.g.]	5.0	5.0	
Economizer	Yes, drybulb	None	
Heat recovery	Total Energy Wheel	None	
System 20	***EL1 Sys1 PSZ (G.S20)***	***EL1 Sys1 PSZ (G.S20)***	
Cooling Cap [kBtu/h] (tons)	37.545 (3.13)	48.208 (4.02)	
Cooling Efficiency	14 SEER	12 SEER	
Heating Cap [kBtu/h]	64.475	86.754	
Heating Efficiency	90%	80%	
Design Airflow [cfm]	693	811	

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
Fan Demand [kW] (bhp)	0.736 (0.99)	0.898 (1.21)	
TSP [in. w.g.]	5.2	5.2	
Economizer	Yes, drybulb	None	
Heat recovery	Total Energy Wheel	None	
System 21	***KITCHEN MAU***	***KITCHEN MAU***	
Heating Cap [kBtu/h]	245.829	305.321	
Heating Efficiency	90%	80%	
Design Airflow [cfm]	2600	2600	
Fan Demand [kW] (bhp)	2.31 (3.12)	2.709 (3.66)	
TSP [in. w.g.]	4.3	4.3	
Economizer	Yes, drybulb	None	
Heat recovery	Total Energy Wheel	None	

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
Envelope			
Wall Assembly	R-13 + 10 ci U-Value = 0.055 Gross Area: 7140 sf Net Area: 5520 sf	R-13 + R-3.8 ci U-Value = 0.084	
Roof Assembly	Same as baseline Gross Area: 13500sf	R-15 Entirely above deck U-Value = 0.063	
Window Assembly	Solarban 70XL w/ thermally broken frame U-Value = 0.37 SHGC = 0.27 VT = 0.57 Gross Area: 1620 sf	Generic glazing: U-Value = 0.57 SHGC = 0.49 VT = 0.81	
Interior Loads			
Lighting	Same as baseline	1.5 W/ft^2	T-8 lamps for both
Daylighting Controls	None	None	
HVAC Systems	DX Split System Furnace	Packaged Single Zone Rooftop Units	
System 1	***EL1 Sys1 PSZ (G.W1)***	***EL1 Sys1 PSZ (G.W1)***	
Cooling Cap [kBtu/h] (tons)	29.990 (2.50)	53.378 (4.45)	
Cooling Efficiency	14 SEER	12 SEER	
Heating Cap [kBtu/h]	61.797	104.814	
Heating Efficiency	90%	80%	
Design Airflow [cfm]	813	1418	
Fan Demand [kW] (bhp)	0.826 (1.12)	1.505 (2.03)	
TSP [in. w.g.]	5.1	5.1	
Economizer	Yes, drybulb	None	
Heat recovery	Total Energy Wheel	None	
System 2	***EL1 Sys1 PSZ (G.C2)***	***EL1 Sys1 PSZ (G.C2)***	
Cooling Cap [kBtu/h] (tons)	22.341 (1.86)	26.059 (2.17)	
Cooling Efficiency	14 SEER	12 SEER	
Heating Cap [kBtu/h]	46.002	52.909	
Heating Efficiency	90%	80%	
Design Airflow [cfm]	604	604	
Fan Demand [kW] (bhp)	0.636 (0.86)	.664 (0.90)	
TSP [in. w.g.]	5.2	5.2	
Economizer	Yes, drybulb	None	

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
Heat recovery	Total Energy Wheel	None	
System 3	***EL1 Sys1 PSZ (G.N3)***	***EL1 Sys1 PSZ (G.N3)***	
Cooling Cap [kBtu/h] (tons)	13.119 (1.09)	17.823 (1.49)	
Cooling Efficiency	14 SEER	12 SEER	
Heating Cap [kBtu/h]	25.985	34.624	
Heating Efficiency	90%	80%	
Design Airflow [cfm]	371	450	
Fan Demand [kW] (bhp)	0.401 (0.54)	0.508 (0.69)	
TSP [in. w.g.]	5.4	5.4	
Economizer	Yes, drybulb	None	
Heat recovery	Total Energy Wheel	None	
System 4	***EL1 Sys1 PSZ (G.S4)***	***EL1 Sys1 PSZ (G.S4)***	
Cooling Cap [kBtu/h] (tons)	16.462 (1.37)	23.028 (1.92)	
Cooling Efficiency	14 SEER	12 SEER	
Heating Cap [kBtu/h]	31.644	44.623	
Heating Efficiency	90%	80%	
Design Airflow [cfm]	498	629	
Fan Demand [kW] (bhp)	0.527 (0.71)	0.695 (0.94)	
TSP [in. w.g.]	5.3	5.3	
Economizer	Yes, drybulb	None	
Heat recovery	Total Energy Wheel	None	
System 5	***EL1 Sys1 PSZ (G.N5)***	***EL1 Sys1 PSZ (G.W1)***	
Cooling Cap [kBtu/h] (tons)	16.691 (1.39)	22.019 (1.83)	
Cooling Efficiency	14 SEER	12 SEER	
Heating Cap [kBtu/h]	33.476	43.255	
Heating Efficiency	90%	80%	
Design Airflow [cfm]	467	548	
Fan Demand [kW] (bhp)	0.497 (0.67)	0.609 (0.82)	
TSP [in. w.g.]	5.3	5.3	
Economizer	Yes, drybulb	None	
Heat recovery	Total Energy Wheel	None	
System 6	***EL1 Sys1 PSZ (G.C6)***	***EL1 Sys1 PSZ (G.C6)***	
Cooling Cap [kBtu/h] (tons)	43.821 (3.65)	51.134 (4.26)	
Cooling Efficiency	14 SEER	12 SEER	
Heating Cap [kBtu/h]	91.017	104.577	
Heating Efficiency	90%	80%	

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
Design Airflow [cfm]	1182	1182	
Fan Demand [kW] (bhp)	1.199 (1.62)	1.252 (1.69)	
TSP [in. w.g.]	5.0	5.0	
Economizer	Yes, drybulb	None	
Heat recovery	Total Energy Wheel	None	
System 7	***EL1 Sys1 PSZ (G.S7)***	***EL1 Sys1 PSZ (G.S7)***	
Cooling Cap [kBtu/h] (tons)	20.055 (1.67)	27.220 (2.27)	
Cooling Efficiency	14 SEER	12 SEER	
Heating Cap [kBtu/h]	39.122	53.154	
Heating Efficiency	90%	80%	
Design Airflow [cfm]	594	724	
Fan Demand [kW] (bhp)	0.625 (0.84)	0.795 (1.07)	
TSP [in. w.g.]	5.2	5.2	
Economizer	Yes, drybulb	None	
Heat recovery	Total Energy Wheel	None	
System 8	***EL1 Sys1 PSZ (G.N8)***	***EL1 Sys1 PSZ (G.N8)***	
Cooling Cap [kBtu/h] (tons)	16.691 (1.39)	20.019 (1.83)	
Cooling Efficiency	14 SEER	12 SEER	
Heating Cap [kBtu/h]	33.476	43.255	
Heating Efficiency	90%	80%	
Design Airflow [cfm]	467	548	
Fan Demand [kW] (bhp)	0.497 (0.67)	0.609 (0.82)	
TSP [in. w.g.]	5.3	5.3	
Economizer	Yes, drybulb	None	
Heat recovery	Total Energy Wheel	None	
System 9	***EL1 Sys1 PSZ (G.C9)***	***EL1 Sys1 PSZ (G.C9)***	
Cooling Cap [kBtu/h] (tons)	43.821 (3.65)	51.134 (4.26)	
Cooling Efficiency	14 SEER	12 SEER	
Heating Cap [kBtu/h]	91.017	104.577	
Heating Efficiency	90%	80%	
Design Airflow [cfm]	1182	1182	
Fan Demand [kW] (bhp)	1.199 (1.62)	1.252 (1.69)	
TSP [in. w.g.]	5.0	5.0	
Economizer	Yes, drybulb	None	
Heat recovery	Total Energy Wheel	None	
System 10	***EL1 Sys1 PSZ (G.S10)***	***EL1 Sys1 PSZ (G.S10)***	

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
Cooling Cap [kBtu/h] (tons)	20.055 (1.67)	27.220 (2.27)	
Cooling Efficiency	14 SEER	12 SEER	
Heating Cap [kBtu/h]	39.122	53.154	
Heating Efficiency	90%	80%	
Design Airflow [cfm]	594	724	
Fan Demand [kW] (bhp)	0.625 (0.84)	0.795 (1.07)	
TSP [in. w.g.]	5.2	5.2	
Economizer	Yes, drybulb	None	
Heat recovery	Total Energy Wheel	None	
System 11	***EL1 Sys1 PSZ (G.N11)***	***EL1 Sys1 PSZ (G.N11)***	
Cooling Cap [kBtu/h] (tons)	16.931 (1.41)	22.292 (1.86)	
Cooling Efficiency	14 SEER	12 SEER	
Heating Cap [kBtu/h]	33.649	43.468	
Heating Efficiency	90%	80%	
Design Airflow [cfm]	471	551	
Fan Demand [kW] (bhp)	0.502 (0.68)	0.613 (0.83)	
TSP [in. w.g.]	5.3	5.3	
Economizer	Yes, drybulb	None	
Heat recovery	Total Energy Wheel	None	
System 12	***EL1 Sys1 PSZ (G.C12)***	***EL1 Sys1 PSZ (G.C12)***	
Cooling Cap [kBtu/h] (tons)	44.585 (3.72)	51.983 (4.33)	
Cooling Efficiency	14 SEER	12 SEER	
Heating Cap [kBtu/h]	91.551	105.251	
Heating Efficiency	90%	80%	
Design Airflow [cfm]	1194	1194	
Fan Demand [kW] (bhp)	1.212 (1.64)	1.265 (1.71)	
TSP [in. w.g.]	5.0	5.0	
Economizer	Yes, drybulb	None	
Heat recovery	Total Energy Wheel	None	
System 13	***EL1 Sys1 PSZ (G.S13)***	***EL1 Sys1 PSZ (G.S13)***	
Cooling Cap [kBtu/h] (tons)	20.303 (1.69)	27.503 (2.29)	
Cooling Efficiency	14 SEER	12 SEER	
Heating Cap [kBtu/h]	39.294	53.371	
Heating Efficiency	90%	80%	
Design Airflow [cfm]	598	728	

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
Fan Demand [kW] (bhp)	0.627 (0.85)	0.797 (1.08)	
TSP [in. w.g.]	5.2	5.2	
Economizer	Yes, drybulb	None	
Heat recovery	Total Energy Wheel	None	
System 14	***EL1 Sys1 PSZ (G.N14)***	***EL1 Sys1 PSZ (G.N14)***	
Cooling Cap [kBtu/h] (tons)	16.691 (1.39)	22.019 (1.83)	
Cooling Efficiency	14 SEER	12 SEER	
Heating Cap [kBtu/h]	33.476	43.255	
Heating Efficiency	90%	80%	
Design Airflow [cfm]	467	548	
Fan Demand [kW] (bhp)	0.497 (0.67)	0.609 (0.82)	
TSP [in. w.g.]	5.3	5.3	
Economizer	Yes, drybulb	None	
Heat recovery	Total Energy Wheel	None	
System 15	***EL1 Sys1 PSZ (G.C15)***	***EL1 Sys1 PSZ (G.C15)***	
Cooling Cap [kBtu/h] (tons)	43.821 (3.65)	51.134 (4.26)	
Cooling Efficiency	14 SEER	12 SEER	
Heating Cap [kBtu/h]	91.017	104.577	
Heating Efficiency	90%	80%	
Design Airflow [cfm]	1182	1182	
Fan Demand [kW] (bhp)	1.199 (1.62)	1.252 (1.69)	
TSP [in. w.g.]	5.0	5.0	
Economizer	Yes, drybulb	None	
Heat recovery	Total Energy Wheel	None	
System 16	***EL1 Sys1 PSZ (G.S16)***	***EL1 Sys1 PSZ (G.S16)***	
Cooling Cap [kBtu/h] (tons)	20.055 (1.67)	27.220 (2.27)	
Cooling Efficiency	14 SEER	12 SEER	
Heating Cap [kBtu/h]	39.122	53.154	
Heating Efficiency	90%	80%	
Design Airflow [cfm]	594	724	
Fan Demand [kW] (bhp)	0.625 (0.84)	0.795 (1.07)	
TSP [in. w.g.]	5.2	5.2	
Economizer	Yes, drybulb	None	
Heat recovery	Total Energy Wheel	None	

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
System 17	***EL1 Sys1 PSZ (G.C17)***	***EL1 Sys1 PSZ (G.C17)***	
Cooling Cap [kBtu/h] (tons)	50.039 (4.17)	58.529 (4.88)	
Cooling Efficiency	14 SEER	10.1 EER	
Heating Cap [kBtu/h]	127.104	137.806	
Heating Efficiency	90%	80%	
Design Airflow [cfm]	1000	1000	
Fan Demand [kW] (bhp)	1.023 (1.38)	1.068 (1.44)	
TSP [in. w.g.]	5.1	5.1	
Economizer	Yes, drybulb	None	
Heat recovery	Total Energy Wheel	None	
System 18	***EL1 Sys1 PSZ (G.N18)***	***EL1 Sys1 PSZ (G.N18)***	
Cooling Cap [kBtu/h] (tons)	26.571 (2.21)	33.886 (2.71)	
Cooling Efficiency	14 SEER	12 SEER	
Heating Cap [kBtu/h]	64.971	73.344	
Heating Efficiency	90%	80%	
Design Airflow [cfm]	543	612	
Fan Demand [kW] (bhp)	0.572 (0.77)	0.675 (0.91)	
TSP [in. w.g.]	5.2	5.2	
Economizer	Yes, drybulb	None	
Heat recovery	Total Energy Wheel	None	
System 19	***EL1 Sys1 PSZ (G.E19)***	***EL1 Sys1 PSZ (G.E19)***	
Cooling Cap [kBtu/h] (tons)	66.347 (5.52)	94.654 (7.89)	
Cooling Efficiency	14 SEER	10.1 EER	
Heating Cap [kBtu/h]	169.267	204.593	
Heating Efficiency	90%	80%	
Design Airflow [cfm]	1325	1750	
Fan Demand [kW] (bhp)	1.328 (1.79)	1.831 (2.47)	
TSP [in. w.g.]	5.0	5.0	
Economizer	Yes, drybulb	None	
Heat recovery	Total Energy Wheel	None	
System 20	***EL1 Sys1 PSZ (G.S20)***	***EL1 Sys1 PSZ (G.S20)***	
Cooling Cap [kBtu/h] (tons)	31.059 (2.59)	41.153 (3.43)	
Cooling Efficiency	14 SEER	12 SEER	
Heating Cap [kBtu/h]	70.456	85.188	
Heating Efficiency	90%	80%	
Design Airflow [cfm]	686	820	

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
Fan Demand [kW] (bhp)	0.714 (0.97)	0.891 (1.20)	
TSP [in. w.g.]	5.2	5.2	
Economizer	Yes, drybulb	None	
Heat recovery	Total Energy Wheel	None	
System 21	***KITCHEN MAU***	***KITCHEN MAU***	
Heating Cap [kBtu/h]	307.162	295.456	
Heating Efficiency	90%	80%	
Design Airflow [cfm]	2650	2650	
Fan Demand [kW] (bhp)	2.31 (3.12)	2.709 (3.24)	
TSP [in. w.g.]	4.3	4.3	
Economizer	Yes, drybulb	None	
Heat recovery	Total Energy Wheel	None	

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
Envelope			
Wall Assembly	R-13 + 10 ci U-Value = 0.055 Gross Area: 7140 sf Net Area: 5520 sf	R-13 + R-3.8 ci U-Value = 0.084	
Roof Assembly	Same as baseline Gross Area: 13500sf	R-15 Entirely above deck U-Value = 0.063	
Window Assembly	Solarban 70XL w/ thermally broken frame U-Value = 0.37 SHGC = 0.27 VT = 0.57 Gross Area: 1620 sf	Generic glazing: U-Value = 0.57 SHGC = 0.49 VT = 0.81	
Interior Loads			
Lighting	Same as baseline	1.5 W/ft^2	T-8 lamps for both
Daylighting Controls	None	None	
HVAC Systems	DX Split System Furnace	Packaged Single Zone Rooftop Units	
System 1	***EL1 Sys1 PSZ (G.W1)***	***EL1 Sys1 PSZ (G.W1)***	
Cooling Cap [kBtu/h] (tons)	26.059 (2.17)	48.095 (4.01)	
Cooling Efficiency	14 SEER	12 SEER	
Heating Cap [kBtu/h]	57.489	107.170	
Heating Efficiency	90%	80%	
Design Airflow [cfm]	845	1527	
Fan Demand [kW] (bhp)	0.806 (1.09)	1.521 (2.05)	
TSP [in. w.g.]	5.1	5.1	
Economizer	Yes, drybulb	None	
Heat recovery	Total Energy Wheel	None	
System 2	***EL1 Sys1 PSZ (G.C2)***	***EL1 Sys1 PSZ (G.C2)***	
Cooling Cap [kBtu/h] (tons)	19.850 (1.65)	21.996 (1.83)	
Cooling Efficiency	14 SEER	12 SEER	
Heating Cap [kBtu/h]	43.422	54.156	
Heating Efficiency	90%	80%	
Design Airflow [cfm]	643	643	
Fan Demand [kW] (bhp)	0.635 (0.86)	.663 (0.90)	
TSP [in. w.g.]	5.2	5.2	
Economizer	Yes, drybulb	None	

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
Heat recovery	Total Energy Wheel	None	
System 3	***EL1 Sys1 PSZ (G.N3)***	***EL1 Sys1 PSZ (G.N3)***	
Cooling Cap [kBtu/h] (tons)	11.277 (0.94)	14.900 (1.24)	
Cooling Efficiency	14 SEER	12 SEER	
Heating Cap [kBtu/h]	23.860	34.040	
Heating Efficiency	90%	80%	
Design Airflow [cfm]	374	457	
Fan Demand [kW] (bhp)	0.380 (0.51)	0.484 (0.64)	
TSP [in. w.g.]	5.4	5.4	
Economizer	Yes, drybulb	None	
Heat recovery	Total Energy Wheel	None	
System 4	***EL1 Sys1 PSZ (G.S4)***	***EL1 Sys1 PSZ (G.S4)***	
Cooling Cap [kBtu/h] (tons)	15.695 (1.31)	21.243 (1.77)	
Cooling Efficiency	14 SEER	12 SEER	
Heating Cap [kBtu/h]	31.329	45.827	
Heating Efficiency	90%	80%	
Design Airflow [cfm]	553	682	
Fan Demand [kW] (bhp)	0.549 (0.74)	0.708 (0.96)	
TSP [in. w.g.]	5.3	5.3	
Economizer	Yes, drybulb	None	
Heat recovery	Total Energy Wheel	None	
System 5	***EL1 Sys1 PSZ (G.N5)***	***EL1 Sys1 PSZ (G.W1)***	
Cooling Cap [kBtu/h] (tons)	14.395 (1.20)	18.358 (1.53)	
Cooling Efficiency	14 SEER	12 SEER	
Heating Cap [kBtu/h]	30.822	42.744	
Heating Efficiency	90%	80%	
Design Airflow [cfm]	475	558	
Fan Demand [kW] (bhp)	0.474 (0.64)	0.582 (0.79)	
TSP [in. w.g.]	5.3	5.3	
Economizer	Yes, drybulb	None	
Heat recovery	Total Energy Wheel	None	
System 6	***EL1 Sys1 PSZ (G.C6)***	***EL1 Sys1 PSZ (G.C6)***	
Cooling Cap [kBtu/h] (tons)	38.847 (3.24)	43.013 (3.58)	
Cooling Efficiency	14 SEER	12 SEER	
Heating Cap [kBtu/h]	85.850	107.084	
Heating Efficiency	90%	80%	

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
Design Airflow [cfm]	1258	1258	
Fan Demand [kW] (bhp)	1.198 (1.62)	1.250 (1.69)	
TSP [in. w.g.]	5.0	5.0	
Economizer	Yes, drybulb	None	
Heat recovery	Total Energy Wheel	None	
System 7	***EL1 Sys1 PSZ (G.S7)***	***EL1 Sys1 PSZ (G.S7)***	
Cooling Cap [kBtu/h] (tons)	18.877 (1.57)	24.738 (2.06)	
Cooling Efficiency	14 SEER	12 SEER	
Heating Cap [kBtu/h]	38.374	54.562	
Heating Efficiency	90%	80%	
Design Airflow [cfm]	656	784	
Fan Demand [kW] (bhp)	0.646 (0.87)	0.807 (1.09)	
TSP [in. w.g.]	5.2	5.2	
Economizer	Yes, drybulb	None	
Heat recovery	Total Energy Wheel	None	
System 8	***EL1 Sys1 PSZ (G.N8)***	***EL1 Sys1 PSZ (G.N8)***	
Cooling Cap [kBtu/h] (tons)	14.395 (1.20)	18.385 (1.53)	
Cooling Efficiency	14 SEER	12 SEER	
Heating Cap [kBtu/h]	30.822	42.744	
Heating Efficiency	90%	80%	
Design Airflow [cfm]	475	558	
Fan Demand [kW] (bhp)	0.474 (0.64)	0.582 (0.77)	
TSP [in. w.g.]	5.3	5.3	
Economizer	Yes, drybulb	None	
Heat recovery	Total Energy Wheel	None	
System 9	***EL1 Sys1 PSZ (G.C9)***	***EL1 Sys1 PSZ (G.C9)***	
Cooling Cap [kBtu/h] (tons)	38.847 (3.24)	43.013 (3.58)	
Cooling Efficiency	14 SEER	12 SEER	
Heating Cap [kBtu/h]	85.850	107.084	
Heating Efficiency	90%	80%	
Design Airflow [cfm]	1258	1258	
Fan Demand [kW] (bhp)	1.198 (1.62)	1.250 (1.69)	
TSP [in. w.g.]	5.0	5.0	
Economizer	Yes, drybulb	None	
Heat recovery	Total Energy Wheel	None	
System 10	***EL1 Sys1 PSZ (G.S10)***	***EL1 Sys1 PSZ (G.S10)***	

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
Cooling Cap [kBtu/h] (tons)	18.877 (1.57)	24.738 (2.06)	
Cooling Efficiency	14 SEER	12 SEER	
Heating Cap [kBtu/h]	38.374	54.562	
Heating Efficiency	90%	80%	
Design Airflow [cfm]	656	784	
Fan Demand [kW] (bhp)	0.646 (0.87)	0.807 (1.09)	
TSP [in. w.g.]	5.2	5.2	
Economizer	Yes, drybulb	None	
Heat recovery	Total Energy Wheel	None	
System 11	***EL1 Sys1 PSZ (G.N11)***	***EL1 Sys1 PSZ (G.N11)***	
Cooling Cap [kBtu/h] (tons)	14.5 (1.21)	18.476 (1.54)	
Cooling Efficiency	14 SEER	12 SEER	
Heating Cap [kBtu/h]	30.995	42.955	
Heating Efficiency	90%	80%	
Design Airflow [cfm]	479	562	
Fan Demand [kW] (bhp)	0.478 (0.65)	0.586 (0.79)	
TSP [in. w.g.]	5.3	5.3	
Economizer	Yes, drybulb	None	
Heat recovery	Total Energy Wheel	None	
System 12	***EL1 Sys1 PSZ (G.C12)***	***EL1 Sys1 PSZ (G.C12)***	
Cooling Cap [kBtu/h] (tons)	39.173 (3.26)	43.384 (3.62)	
Cooling Efficiency	14 SEER	12 SEER	
Heating Cap [kBtu/h]	86.387	107.752	
Heating Efficiency	90%	80%	
Design Airflow [cfm]	1271	1271	
Fan Demand [kW] (bhp)	1.210 (1.64)	1.263 (1.71)	
TSP [in. w.g.]	5.0	5.0	
Economizer	Yes, drybulb	None	
Heat recovery	Total Energy Wheel	None	
System 13	***EL1 Sys1 PSZ (G.S13)***	***EL1 Sys1 PSZ (G.S13)***	
Cooling Cap [kBtu/h] (tons)	18.975 (1.58)	24.848 (2.07)	
Cooling Efficiency	14 SEER	12 SEER	
Heating Cap [kBtu/h]	38.547	54.778	
Heating Efficiency	90%	80%	
Design Airflow [cfm]	660	788	

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
Fan Demand [kW] (bhp)	0.649 (0.88)	0.810 (1.09)	
TSP [in. w.g.]	5.2	5.2	
Economizer	Yes, drybulb	None	
Heat recovery	Total Energy Wheel	None	
System 14	***EL1 Sys1 PSZ (G.N14)***	***EL1 Sys1 PSZ (G.N14)***	
Cooling Cap [kBtu/h] (tons)	14.395 (1.20)	18.358 (1.53)	
Cooling Efficiency	14 SEER	12 SEER	
Heating Cap [kBtu/h]	30.822	42.744	
Heating Efficiency	90%	80%	
Design Airflow [cfm]	475	558	
Fan Demand [kW] (bhp)	0.474 (0.64)	0.582 (0.79)	
TSP [in. w.g.]	5.3	5.3	
Economizer	Yes, drybulb	None	
Heat recovery	Total Energy Wheel	None	
System 15	***EL1 Sys1 PSZ (G.C15)***	***EL1 Sys1 PSZ (G.C15)***	
Cooling Cap [kBtu/h] (tons)	38.847 (3.24)	43.013 (3.58)	
Cooling Efficiency	14 SEER	12 SEER	
Heating Cap [kBtu/h]	85.850	107.084	
Heating Efficiency	90%	80%	
Design Airflow [cfm]	1258	1258	
Fan Demand [kW] (bhp)	1.198 (1.62)	1.250 (1.69)	
TSP [in. w.g.]	5.0	5.0	
Economizer	Yes, drybulb	None	
Heat recovery	Total Energy Wheel	None	
System 16	***EL1 Sys1 PSZ (G.S16)***	***EL1 Sys1 PSZ (G.S16)***	
Cooling Cap [kBtu/h] (tons)	18.877 (1.57)	24.738 (2.06)	
Cooling Efficiency	14 SEER	12 SEER	
Heating Cap [kBtu/h]	38.374	54.562	
Heating Efficiency	90%	80%	
Design Airflow [cfm]	656	784	
Fan Demand [kW] (bhp)	0.646 (0.87)	0.807 (1.09)	
TSP [in. w.g.]	5.2	5.2	
Economizer	Yes, drybulb	None	
Heat recovery	Total Energy Wheel	None	

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
System 17	***EL1 Sys1 PSZ (G.C17)***	***EL1 Sys1 PSZ (G.C17)***	
Cooling Cap [kBtu/h] (tons)	41.057 (3.42)	45.143 (3.76)	
Cooling Efficiency	14 SEER	10.1 EER	
Heating Cap [kBtu/h]	115.462	144.118	
Heating Efficiency	90%	80%	
Design Airflow [cfm]	1065	1065	
Fan Demand [kW] (bhp)	1.022 (1.38)	1.067 (1.44)	
TSP [in. w.g.]	5.1	5.1	
Economizer	Yes, drybulb	None	
Heat recovery	Total Energy Wheel	None	
System 18	***EL1 Sys1 PSZ (G.N18)***	***EL1 Sys1 PSZ (G.N18)***	
Cooling Cap [kBtu/h] (tons)	21.528 (1.79)	25.883 (2.16)	
Cooling Efficiency	14 SEER	12 SEER	
Heating Cap [kBtu/h]	58.975	77.043	
Heating Efficiency	90%	80%	
Design Airflow [cfm]	570	646	
Fan Demand [kW] (bhp)	0.564 (0.76)	0.667 (0.90)	
TSP [in. w.g.]	5.2	5.2	
Economizer	Yes, drybulb	None	
Heat recovery	Total Energy Wheel	None	
System 19	***EL1 Sys1 PSZ (G.E19)***	***EL1 Sys1 PSZ (G.E19)***	
Cooling Cap [kBtu/h] (tons)	54.101 (4.51)	69.626 (5.80)	
Cooling Efficiency	14 SEER	10.1 EER	
Heating Cap [kBtu/h]	153.156	207.383	
Heating Efficiency	90%	80%	
Design Airflow [cfm]	1394	1756	
Fan Demand [kW] (bhp)	1.311 (1.77)	1.724 (2.33)	
TSP [in. w.g.]	5.0	5.0	
Economizer	Yes, drybulb	None	
Heat recovery	Total Energy Wheel	None	
System 20	***EL1 Sys1 PSZ (G.S20)***	***EL1 Sys1 PSZ (G.S20)***	
Cooling Cap [kBtu/h] (tons)	26.024 (2.17)	32.682 (2.72)	
Cooling Efficiency	14 SEER	12 SEER	
Heating Cap [kBtu/h]	65.560	88.639	
Heating Efficiency	90%	80%	
Design Airflow [cfm]	746	886	

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
Fan Demand [kW] (bhp)	0.729 (0.99)	0.903 (1.22)	
TSP [in. w.g.]	5.2	5.2	
Economizer	Yes, drybulb	None	
Heat recovery	Total Energy Wheel	None	
System 21	***KITCHEN MAU***	***KITCHEN MAU***	
Heating Cap [kBtu/h]	259.521	322.428	
Heating Efficiency	90%	80%	
Design Airflow [cfm]	2825	2825	
Fan Demand [kW] (bhp)	2.31 (3.12)	2.709 (3.66)	
TSP [in. w.g.]	4.3	4.3	
Economizer	Yes, drybulb	None	
Heat recovery	Total Energy Wheel	None	

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
Envelope			
Wall Assembly	R-19+7.5 ci Gross Area: 26000 sf Net Area: 25480 sf		
Roof Assembly	R-30 Gross Area: 100000 sf		
Window Assembly	Solarban 70XL Starphire w/ thermally broken aluminum frame: U-0.42; SHGC-0.27; VLT-0.563 Gross Area: 520 sf	Generic glazing: U-0.47; SHGC-0.39; VLT-0.81	
Interior Loads			
Lighting	Same as baseline		
Daylighting Controls	None	None	
HVAC Systems	Packaged Single Zone Rooftop Units	Packaged Rooftop VAV w/ HW Reheat	
System 1	***EL1 Sys1 PSZ (G.S1)***	***EL1 Sys1 PVAVS (G)***	
Cooling Cap [kBtu/h] (tons)	191.086 (16)	602.969 (51)	
Cooling Efficiency	9.5 EER	9.3 EER	
Heating Cap [kBtu/h]	370.328		
Heating Efficiency	80%		
Design Airflow [cfm]	4396	16578	
Fan Demand [kW] (bhp)	2.968 (4.0)	13.643 (18.3)	
TSP [in. w.g.]	3.3	3.8	
Economizer	Yes, drybulb	Yes, drybulb	
Heat recovery	Yes, enthalpy wheel	None	
Associated VAV Boxes	N/A	1 @ 6565, 273 kBtu/h heating 1 @ 4117, 171 kBtu/h heating 1 @ 5084, 212 kBtu/h heating 1 @ 812, 34 kBtu/h heating	
System 2	***EL1 Sys1 PSZ (G.E2)***	***HVAC System 2***	
Cooling Cap [kBtu/h] (tons)	115.628 (10)	619.921 (52)	
Cooling Efficiency	10.1 EER	9.3 EER	
Heating Cap [kBtu/h]	223.824		
Heating Efficiency	80%		
Design Airflow [cfm]	2639	16222	

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
Fan Demand [kW] (bhp)	1.851 (2.5)	13.350 (17.9)	
TSP [in. w.g.]	3.5	3.8	
Economizer	Yes, drybulb	Yes, drybulb	
Heat recovery	Yes, enthalpy wheel	None	
Associated VAV Boxes	N/A	1@ 3948 cfm, 164 kBtu/h heating 1 @ 1531 cfm, 64 kBtu/h heating 1 @ 10743 cfm, 447 kBtu/h	
System 3	***EL1 Sys1 PSZ (G.N3)***	***HVAC System 3***	
Cooling Cap [kBtu/h] (tons)	139.173 (12)	1348.173 (113)	
Cooling Efficiency	9.5 EER	9.0 EER	
Heating Cap [kBtu/h]	271.369		
Heating Efficiency	80%		
Design Airflow [cfm]	3124	34863	
Fan Demand [kW] (bhp)	2.178 (2.9)	28.093 (37.7)	
TSP [in. w.g.]	3.5	3.8	
Economizer	Yes, drybulb	Yes, drybulb	
Heat recovery	Yes, enthalpy wheel	None	
Associated VAV Boxes	N/A	1@ 34863 cfm, 1449 kBtu/h heating	
System 4	***EL1 Sys1 PSZ (G.W4)***	***HVAC System 4***	
Cooling Cap [kBtu/h] (tons)	22.104 (2)	1478.953 (124)	
Cooling Efficiency	12 SEER	9.0 EER	
Heating Cap [kBtu/h]	41.827		
Heating Efficiency	80%		
Design Airflow [cfm]	512	38272	
Fan Demand [kW] (bhp)	0.421 (0.6)	30.840 (41.3)	
TSP [in. w.g.]	4.1	3.8	
Economizer	Yes, drybulb	Yes, drybulb	
Heat recovery	Yes, enthalpy wheel	None	
Associated VAV Boxes	N/A	1 @ 38272 cfm, 1590 kBtu/h heating	
System 5	***EL1 Sys1 PSZ (G.C5)***		
Cooling Cap [kBtu/h] (tons)	814.303 (68)		

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
Cooling Efficiency	9 EER		
Heating Cap [kBtu/h]	1697.232		
Heating Efficiency	80%		
Design Airflow [cfm]	16698		
Fan Demand [kW] (bhp)	10.297 (13.8)		
TSP [in. w.g.]	3.1		
Economizer	Yes, drybulb		
Heat recovery	Yes, enthalpy wheel		
Associated VAV Boxes	N/A		
System 6	***EL1 Sys1 PSZ (G.W6)***		
Cooling Cap [kBtu/h] (tons)	79.731 (6)		
Cooling Efficiency	10.1 EER		
Heating Cap [kBtu/h]	142.927		
Heating Efficiency	80%		
Design Airflow [cfm]	2285		
Fan Demand [kW] (bhp)	1.635 (2.2)		
TSP [in. w.g.]	3.5		
Economizer	Yes, drybulb		
Heat recovery	Yes, enthalpy wheel		
Associated VAV Boxes	N/A		
System 7	***EL1 Sys1 PSZ (G.N7)***		
Cooling Cap [kBtu/h] (tons)	33.851 (3)		
Cooling Efficiency	12 SEER		
Heating Cap [kBtu/h]	60.314		
Heating Efficiency	80%		
Design Airflow [cfm]	924		
Fan Demand [kW] (bhp)	0.715 (1.0)		
TSP [in. w.g.]	3.8		
Economizer	Yes, drybulb		
Heat recovery	Yes, enthalpy wheel		
Associated VAV Boxes	N/A		
System 8	***EL1 Sys1 PSZ (G.C8)***		
Cooling Cap [kBtu/h] (tons)	297.548 (25)		
Cooling Efficiency	9.3 EER		

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
Heating Cap [kBtu/h]	564.164		
Heating Efficiency	80%		
Design Airflow [cfm]	7840		
Fan Demand [kW] (bhp)	5.277 (7.1)		
TSP [in. w.g.]	3.3		
Economizer	Yes, drybulb		
Heat recovery	Yes, enthalpy wheel		
Associated VAV Boxes	N/A		
System 9	***EL1 Sys1 PSZ (SOUTH CORE)***		
Cooling Cap [kBtu/h] (tons)	893.003 (75)		
Cooling Efficiency	9.0 EER		
Heating Cap [kBtu/h]	1860.654		
Heating Efficiency	80%		
Design Airflow [cfm]	18335		
Fan Demand [kW] (bhp)	11.270 (15.1)		
TSP [in. w.g.]	3.0		
Economizer	Yes, drybulb		
Heat recovery	Yes, enthalpy wheel		
Associated VAV Boxes	N/A		

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
Envelope			
Wall Assembly	R-19+7.5 ci Gross Area: 26000 sf Net Area: 25480 sf		
Roof Assembly	R-30 Gross Area: 100000 sf		
Window Assembly	Solarban 70XL Starphire w/ thermally broken aluminum frame: U-0.42; SHGC-0.27; VLT-0.563 Gross Area: 520 sf	Generic glazing: U-0.47; SHGC-0.39; VLT-0.81	
Interior Loads			
Lighting	Same as baseline		
Daylighting Controls	None	None	
HVAC Systems	Packaged Single Zone Rooftop Units	Packaged Rooftop VAV w/ HW Reheat	
System 1	***EL1 Sys1 PSZ (G.S1)***	***EL1 Sys1 PVAVS (G)***	
Cooling Cap [kBtu/h] (tons)	218.624 (19)	632.221 (53)	
Cooling Efficiency	9.5 EER	9.3 EER	
Heating Cap [kBtu/h]	446.763		
Heating Efficiency	80%		
Design Airflow [cfm]	5280	18386	
Fan Demand [kW] (bhp)	3.465 (4.7)	14.845 (19.9)	
TSP [in. w.g.]	3.3	3.8	
Economizer	Yes, drybulb	Yes, drybulb	
Heat recovery	Yes, enthalpy wheel	None	
Associated VAV Boxes	N/A	1 @ 7228, 295 kBtu/h heating 1 @ 4588, 187 kBtu/h heating 1 @ 5663, 231 kBtu/h heating 1 @ 906, 37 kBtu/h heating	
System 2	***EL1 Sys1 PSZ (G.E2)***	***HVAC System 2***	
Cooling Cap [kBtu/h] (tons)	131.515 (11)	626.624 (53)	
Cooling Efficiency	10.1 EER	9.3 EER	
Heating Cap [kBtu/h]	268.908		
Heating Efficiency	80%		
Design Airflow [cfm]	3142	17010	

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
Fan Demand [kW] (bhp)	2.142 (2.9)	13.734 (18.4)	
TSP [in. w.g.]	3.5	3.8	
Economizer	Yes, drybulb	Yes, drybulb	
Heat recovery	Yes, enthalpy wheel	None	
Associated VAV Boxes	N/A	1@ 4291 cfm, 175 kBtu/h heating 1 @ 1704 cfm, 70 kBtu/h heating 1 @ 11015 cfm, 449 kBtu/h	
System 3	***EL1 Sys1 PSZ (G.N3)***	***HVAC System 3***	
Cooling Cap [kBtu/h] (tons)	157.651 (14)	1336.796 (112)	
Cooling Efficiency	9.5 EER	9.0 EER	
Heating Cap [kBtu/h]	325.589		
Heating Efficiency	80%		
Design Airflow [cfm]	3699	35534	
Fan Demand [kW] (bhp)	2.507 (3.4)	28.093 (37.7)	
TSP [in. w.g.]	3.5	3.8	
Economizer	Yes, drybulb	Yes, drybulb	
Heat recovery	Yes, enthalpy wheel	None	
Associated VAV Boxes	N/A	1@ 35534 cfm, 1449 kBtu/h heating	
System 4	***EL1 Sys1 PSZ (G.W4)***	***HVAC System 4***	
Cooling Cap [kBtu/h] (tons)	25.011 (2.1)	1466.521 (123)	
Cooling Efficiency	12 SEER	9.0 EER	
Heating Cap [kBtu/h]	49.924		
Heating Efficiency	80%		
Design Airflow [cfm]	604	39008	
Fan Demand [kW] (bhp)	0.482 (0.7)	30.840 (41.3)	
TSP [in. w.g.]	4.1	3.8	
Economizer	Yes, drybulb	Yes, drybulb	
Heat recovery	Yes, enthalpy wheel	None	
Associated VAV Boxes	N/A	1 @ 39008 cfm, 1590 kBtu/h heating	
System 5	***EL1 Sys1 PSZ (G.C5)***		
Cooling Cap [kBtu/h] (tons)	918.934 (77)		

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
Cooling Efficiency	9 EER		
Heating Cap [kBtu/h]	2054.764		
Heating Efficiency	80%		
Design Airflow [cfm]	19814		
Fan Demand [kW] (bhp)	11.877 (16)		
TSP [in. w.g.]	3.1		
Economizer	Yes, drybulb		
Heat recovery	Yes, enthalpy wheel		
Associated VAV Boxes	N/A		
System 6	***EL1 Sys1 PSZ (G.W6)***		
Cooling Cap [kBtu/h] (tons)	89.740 (7.5)		
Cooling Efficiency	10.1 EER		
Heating Cap [kBtu/h]	166.412		
Heating Efficiency	80%		
Design Airflow [cfm]	2671		
Fan Demand [kW] (bhp)	1.857 (2.5)		
TSP [in. w.g.]	3.5		
Economizer	Yes, drybulb		
Heat recovery	Yes, enthalpy wheel		
Associated VAV Boxes	N/A		
System 7	***EL1 Sys1 PSZ (G.N7)***		
Cooling Cap [kBtu/h] (tons)	33.851 (3.2)		
Cooling Efficiency	12 SEER		
Heating Cap [kBtu/h]	71.066		
Heating Efficiency	80%		
Design Airflow [cfm]	1092		
Fan Demand [kW] (bhp)	0.822 (1.1)		
TSP [in. w.g.]	3.8		
Economizer	Yes, drybulb		
Heat recovery	Yes, enthalpy wheel		
Associated VAV Boxes	N/A		
System 8	***EL1 Sys1 PSZ (G.C8)***		
Cooling Cap [kBtu/h] (tons)	338.683 (28.2)		
Cooling Efficiency	9.3 EER		

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
Heating Cap [kBtu/h]	669.926		
Heating Efficiency	80%		
Design Airflow [cfm]	9298		
Fan Demand [kW] (bhp)	6.083 (8.2)		
TSP [in. w.g.]	3.3		
Economizer	Yes, drybulb		
Heat recovery	Yes, enthalpy wheel		
Associated VAV Boxes	N/A		
System 9	***EL1 Sys1 PSZ (SOUTH CORE)***		
Cooling Cap [kBtu/h] (tons)	1007.795 (84)		
Cooling Efficiency	9.0 EER		
Heating Cap [kBtu/h]	2252.462		
Heating Efficiency	80%		
Design Airflow [cfm]	21758		
Fan Demand [kW] (bhp)	12.999 (17.4)		
TSP [in. w.g.]	3.0		
Economizer	Yes, drybulb		
Heat recovery	Yes, enthalpy wheel		
Associated VAV Boxes	N/A		

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
Envelope			
Wall Assembly	R-19+7.5 ci Gross Area: 26000 sf Net Area: 25480 sf		
Roof Assembly	R-30 Gross Area: 100000 sf		
Window Assembly	Solarban 70XL Starphire w/ thermally broken aluminum frame: U-0.42; SHGC-0.27; VLT-0.563 Gross Area: 520 sf	Generic glazing: U-0.47; SHGC-0.39; VLT-0.81	
Interior Loads			
Lighting	Same as baseline		
Daylighting Controls	None	None	
HVAC Systems	Packaged Single Zone Rooftop Units	Packaged Rooftop VAV w/ HW Reheat	
System 1	***EL1 Sys1 PSZ (G.S1)***	***EL1 Sys1 PVAVS (G)***	
Cooling Cap [kBtu/h] (tons)	160.855 (19)	515.053 (43)	
Cooling Efficiency	9.5 EER	9.3 EER	
Heating Cap [kBtu/h]	398.601		
Heating Efficiency	80%		
Design Airflow [cfm]	4899	17846	
Fan Demand [kW] (bhp)	3.044 (4.1)	13.517 (18.2)	
TSP [in. w.g.]	3.3	3.8	
Economizer	Yes, drybulb	Yes, drybulb	
Heat recovery	Yes, enthalpy wheel	None	
Associated VAV Boxes	N/A	1 @ 7588, 191 kBtu/h heating 1 @ 4283, 164 kBtu/h heating 1 @ 5137, 197 kBtu/h heating 1 @ 838, 32 kBtu/h heating	
System 2	***EL1 Sys1 PSZ (G.E2)***	***HVAC System 2***	
Cooling Cap [kBtu/h] (tons)	92.096 (7.7)	554.132 (47)	
Cooling Efficiency	10.1 EER	9.3 EER	
Heating Cap [kBtu/h]	232.159		
Heating Efficiency	80%		
Design Airflow [cfm]	2721	17970	

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
Fan Demand [kW] (bhp)	1.757 (2.4)	13.610 (18.3)	
TSP [in. w.g.]	3.5	3.8	
Economizer	Yes, drybulb	Yes, drybulb	
Heat recovery	Yes, enthalpy wheel	None	
Associated VAV Boxes	N/A	1@ 44763 cfm, 171 kBtu/h heating 1 @ 1544 cfm, 59 kBtu/h heating 1 @ 11952 cfm, 457 kBtu/h	
System 3	***EL1 Sys1 PSZ (G.N3)***	***HVAC System 3***	
Cooling Cap [kBtu/h] (tons)	108.557 (9)	1182.612 (99)	
Cooling Efficiency	9.5 EER	9.0 EER	
Heating Cap [kBtu/h]	278.967		
Heating Efficiency	80%		
Design Airflow [cfm]	3136	37880	
Fan Demand [kW] (bhp)	2.012 (2.7)	28.093 (37.7)	
TSP [in. w.g.]	3.5	3.8	
Economizer	Yes, drybulb	Yes, drybulb	
Heat recovery	Yes, enthalpy wheel	None	
Associated VAV Boxes	N/A	1@ 37880 cfm, 1449 kBtu/h heating	
System 4	***EL1 Sys1 PSZ (G.W4)***	***HVAC System 4***	
Cooling Cap [kBtu/h] (tons)	18.079 (1.5)	1297.577 (109)	
Cooling Efficiency	12 SEER	9.0 EER	
Heating Cap [kBtu/h]	43.870		
Heating Efficiency	80%		
Design Airflow [cfm]	544	41584	
Fan Demand [kW] (bhp)	0.412 (0.6)	30.840 (41.3)	
TSP [in. w.g.]	4.1	3.8	
Economizer	Yes, drybulb	Yes, drybulb	
Heat recovery	Yes, enthalpy wheel	None	
Associated VAV Boxes	N/A	1 @ 41584 cfm, 1590 kBtu/h heating	
System 5	***EL1 Sys1 PSZ (G.C5)***		
Cooling Cap [kBtu/h] (tons)	665.290 (56)		

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
Cooling Efficiency	9 EER		
Heating Cap [kBtu/h]	1833.368		
Heating Efficiency	80%		
Design Airflow [cfm]	18141		
Fan Demand [kW] (bhp)	10.296 (13.8)		
TSP [in. w.g.]	3.1		
Economizer	Yes, drybulb		
Heat recovery	Yes, enthalpy wheel		
Associated VAV Boxes	N/A		
System 6	***EL1 Sys1 PSZ (G.W6)***		
Cooling Cap [kBtu/h] (tons)	69.526 (5.8)		
Cooling Efficiency	10.1 EER		
Heating Cap [kBtu/h]	147.336		
Heating Efficiency	80%		
Design Airflow [cfm]	2482		
Fan Demand [kW] (bhp)	1.634 (2.2)		
TSP [in. w.g.]	3.5		
Economizer	Yes, drybulb		
Heat recovery	Yes, enthalpy wheel		
Associated VAV Boxes	N/A		
System 7	***EL1 Sys1 PSZ (G.N7)***		
Cooling Cap [kBtu/h] (tons)	27.113 (2.3)		
Cooling Efficiency	12 SEER		
Heating Cap [kBtu/h]	58.879		
Heating Efficiency	80%		
Design Airflow [cfm]	918		
Fan Demand [kW] (bhp)	0.654 (0.9)		
TSP [in. w.g.]	3.8		
Economizer	Yes, drybulb		
Heat recovery	Yes, enthalpy wheel		
Associated VAV Boxes	N/A		
System 8	***EL1 Sys1 PSZ (G.C8)***		
Cooling Cap [kBtu/h] (tons)	256.706 (21.4)		
Cooling Efficiency	9.3 EER		

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
Heating Cap [kBtu/h]	590.325		
Heating Efficiency	80%		
Design Airflow [cfm]	8515		
Fan Demand [kW] (bhp)	5.275 (7.1)		
TSP [in. w.g.]	3.3		
Economizer	Yes, drybulb		
Heat recovery	Yes, enthalpy wheel		
Associated VAV Boxes	N/A		
System 9	***EL1 Sys1 PSZ (SOUTH CORE)***		
Cooling Cap [kBtu/h] (tons)	729.718 (61)		
Cooling Efficiency	9.0 EER		
Heating Cap [kBtu/h]	2009.720		
Heating Efficiency	80%		
Design Airflow [cfm]	19922		
Fan Demand [kW] (bhp)	11.270 (15.1)		
TSP [in. w.g.]	3.0		
Economizer	Yes, drybulb		
Heat recovery	Yes, enthalpy wheel		
Associated VAV Boxes	N/A		

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
Envelope			
Wall Assembly	Same as baseline	R-13 + R-3.8 c.i., U =0.084 Gross Area: 13540 sf Net Area: 11100 sf	
Roof Assembly	R-17 entirely above deck Gross Area: 50000 sf	R-15 entirely above deck Gross Area: 50000 sf	
Window Assembly	Same as baseline	Generic glazing: U-0.57; SHGC-0.39; VLT-0.81 Gross Area: 2440 sf	
Interior Loads			
Lighting	Same as baseline	LPD = 1.2 W/sf	T-8 lamps for both
Daylighting Controls	None	None	
HVAC Systems	Packaged Single Zone Heat Pumps	Packaged Single Zone Heat Pumps	
System 1	***EL1 Sys1 PSZ (G.NW1)***	***HVAC System 1***	
Cooling Cap [kBtu/h] (tons)	48.995 (4)	52.226 (5)	
Cooling Efficiency	Same as baseline	13.0 SEER	
Heating Cap [kBtu/h]	39.337	45.577	
Heating Efficiency	Same as baseline	7.7 HSPF	
Design Airflow [cfm]	819	1023	
Fan Demand [kW] (bhp)	0.616 (0.9)	0.770 (1.1)	
TSP [in. w.g.]	Same as baseline	3.5	
Economizer	Same as baseline	Yes, drybulb	
Heat recovery	Yes, enthalpy wheel	None	
System 2	***EL1 Sys1 PSZ (G.W2)***	***HVAC System 2***	
Cooling Cap [kBtu/h] (tons)	157.754 (14)	158.030 (14)	
Cooling Efficiency	Same as baseline	9.3 EER	
Heating Cap [kBtu/h]	125.860	126.080	
Heating Efficiency	Same as baseline	3.1 COP	
Design Airflow [cfm]	3024	3023	
Fan Demand [kW] (bhp)	Same as baseline	2.053 (2.8)	
TSP [in. w.g.]	Same as baseline	3.2	
Economizer	Same as baseline	Yes, drybulb	
Heat recovery	Yes, enthalpy wheel	None	

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
System 3	***EL1 Sys1 PSZ (G.SSW3)***	***HVAC System 3***	
Cooling Cap [kBtu/h] (tons)	159.387 (14)	159.679 (14)	
Cooling Efficiency	Same as baseline	9.3 EER	
Heating Cap [kBtu/h]	127.163	127.396	
Heating Efficiency	Same as baseline	3.1 COP	
Design Airflow [cfm]	3198	3196	
Fan Demand [kW] (bhp)	Same as baseline	2.164 (2.9)	
TSP [in. w.g.]	Same as baseline	3.2	
Economizer	Same as baseline	Yes, drybulb	
Heat recovery	Yes, enthalpy wheel	None	
System 4	***EL1 Sys1 PSZ (G.S4)***	***HVAC System 4***	
Cooling Cap [kBtu/h] (tons)	155.859 (13)	156.085 (13)	
Cooling Efficiency	Same as baseline	9.3 EER	
Heating Cap [kBtu/h]	124.348	124.529	
Heating Efficiency	Same as baseline	3.1 COP	
Design Airflow [cfm]	3098	3095	
Fan Demand [kW] (bhp)	2.103 (2.9)	2.099 (2.9)	
TSP [in. w.g.]	Same as baseline	3.2	
Economizer	Same as baseline	Yes, drybulb	
Heat recovery	Yes, enthalpy wheel	None	
System 5	***EL1 Sys1 PSZ (G.N5)***	***HVAC System 5***	
Cooling Cap [kBtu/h] (tons)	129.977 (11)	130.212 (11)	
Cooling Efficiency	Same as baseline	10.1 EER	
Heating Cap [kBtu/h]	104.920	105.109	
Heating Efficiency	Same as baseline	3.2 COP	
Design Airflow [cfm]	2437	2436	
Fan Demand [kW] (bhp)	1.696 (2.3)	1.698 (2.3)	
TSP [in. w.g.]	Same as baseline	3.3	
Economizer	Same as baseline	Yes, drybulb	
Heat recovery	Yes, enthalpy wheel	None	

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
System 6	***EL1 Sys1 PSZ (G.C6)***	***HVAC System 6***	
Cooling Cap [kBtu/h] (tons)	382.721 (32)	384.698 (32)	
Cooling Efficiency	Same as baseline	9.0 EER	
Heating Cap [kBtu/h]	315.495	317.125	
Heating Efficiency	Same as baseline	3.1 COP	
Design Airflow [cfm]	Same as baseline	8493	
Fan Demand [kW] (bhp)	5.165 (7.0)	5.167 (7.0)	
TSP [in. w.g.]	Same as baseline	2.8	
Economizer	Same as baseline	Yes, drybulb	
Heat recovery	Yes, enthalpy wheel	None	
System 7	***EL1 Sys1 PSZ (G.N7)***	***HVAC System 7***	
Cooling Cap [kBtu/h] (tons)	137.910 (12)	138.138 (12)	
Cooling Efficiency	Same as baseline	9.3 EER	
Heating Cap [kBtu/h]	110.028	110.210	
Heating Efficiency	Same as baseline	3.1 COP	
Design Airflow [cfm]	Same as baseline	2589	
Fan Demand [kW] (bhp)	1.774 (2.4)	1.772 (2.4)	
TSP [in. w.g.]	Same as baseline	3.2	
Economizer	Same as baseline	Yes, drybulb	
Heat recovery	Yes, enthalpy wheel	None	
System 8	***EL1 Sys1 PSZ (G.N8)***	***HVAC System 8***	
Cooling Cap [kBtu/h] (tons)	92.702 (8)	92.864 (8)	
Cooling Efficiency	Same as baseline	10.1 EER	
Heating Cap [kBtu/h]	74.831	74.961	
Heating Efficiency	Same as baseline	3.2 COP	
Design Airflow [cfm]	1736	1735	
Fan Demand [kW] (bhp)	Same as baseline	1.249 (1.7)	
TSP [in. w.g.]	Same as baseline	3.4	
Economizer	Same as baseline	Yes, drybulb	
Heat recovery	Yes, enthalpy wheel	None	

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
System 9	***EL1 Sys1 PSZ (G.NE9)***	***HVAC System 9***	
Cooling Cap [kBtu/h] (tons)	54.862 (5)	54.949 (5)	
Cooling Efficiency	Same as baseline	13.0 SEER	
Heating Cap [kBtu/h]	47.878	47.954	
Heating Efficiency	Same as baseline	7.7 HSPF	
Design Airflow [cfm]	1111	1110	
Fan Demand [kW] (bhp)	0.832 (1.2)	0.831 (1.2)	
TSP [in. w.g.]	Same as baseline	3.5	
Economizer	Same as baseline	Yes, drybulb	
Heat recovery	Yes, enthalpy wheel	None	
System 10	***EL1 Sys1 PSZ (G.E10)***	***HVAC System 10***	
Cooling Cap [kBtu/h] (tons)	166.805 (14)	167.089 (14)	
Cooling Efficiency	Same as baseline	9.3 EER	
Heating Cap [kBtu/h]	133.081	133.308	
Heating Efficiency	Same as baseline	3.1 COP	
Design Airflow [cfm]	3302	3300	
Fan Demand [kW] (bhp)	2.235 (3.0)	2.232 (3.0)	
TSP [in. w.g.]	Same as baseline	3.2	
Economizer	Same as baseline	Yes, drybulb	
Heat recovery	Yes, enthalpy wheel	None	
System 11	***EL1 Sys1 PSZ (G.SE11)***	***HVAC System 11***	
Cooling Cap [kBtu/h] (tons)	57.761 (5)	57.853 (5)	
Cooling Efficiency	Same as baseline	13.0 SEER	
Heating Cap [kBtu/h]	50.407	50.488	
Heating Efficiency	Same as baseline	7.7 HSPF	
Design Airflow [cfm]	1204	1202	
Fan Demand [kW] (bhp)	0.897 (1.2)	0.895 (1.2)	
TSP [in. w.g.]	Same as baseline	3.5	
Economizer	Same as baseline	Yes, drybulb	
Heat recovery	Yes, enthalpy wheel	None	

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
System 12	***EL1 Sys1 PSZ (G.S12)***	***HVAC System 12***	
Cooling Cap [kBtu/h] (tons)	152.101 (13)	152.340 (13)	
Cooling Efficiency	Same as baseline	9.3 EER	
Heating Cap [kBtu/h]	121.350	121.541	
Heating Efficiency	Same as baseline	3.1 COP	
Design Airflow [cfm]	3022	3019	
Fan Demand [kW] (bhp)	Same as baseline	2.051 (2.8)	
TSP [in. w.g.]	3.2	3.2	
Economizer	Same as baseline	Yes, drybulb	
Heat recovery	Yes, enthalpy wheel	None	
System 13	***EL1 Sys1 PSZ (G.S13)***	***HVAC System 13***	
Cooling Cap [kBtu/h] (tons)	135.332 (12)	135.535 (12)	
Cooling Efficiency	Same as baseline	9.3 EER	
Heating Cap [kBtu/h]	109.242	109.406	
Heating Efficiency	Same as baseline	3.1 COP	
Design Airflow [cfm]	2691	2688	
Fan Demand [kW] (bhp)	1.839 (2.5)	1.836 (2.5)	
TSP [in. w.g.]	Same as baseline	3.2	
Economizer	Same as baseline	Yes, drybulb	
Heat recovery	Yes, enthalpy wheel	None	
System 14	***EL1 Sys1 PSZ (G.C14)***	***HVAC System 14***	
Cooling Cap [kBtu/h] (tons)	36.985 (4)	37.355 (4)	
Cooling Efficiency	Same as baseline	13.0 SEER	
Heating Cap [kBtu/h]	32.276	32.600	
Heating Efficiency	Same as baseline	7.7 HSPF	
Design Airflow [cfm]	Same as baseline	932	
Fan Demand [kW] (bhp)	Same as baseline	0.716 (1.0)	
TSP [in. w.g.]	Same as baseline	3.6	
Economizer	Same as baseline	Yes, drybulb	
Heat recovery	Yes, enthalpy wheel	None	

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
System 15	***EL1 Sys1 PSZ (G.C15)***	***HVAC System 15***	
Cooling Cap [kBtu/h] (tons)	94.440 (8)	94.693 (8)	
Cooling Efficiency	Same as baseline	10.1 EER	
Heating Cap [kBtu/h]	76.233	76.437	
Heating Efficiency	Same as baseline	3.2 COP	
Design Airflow [cfm]	Same as baseline	1802	
Fan Demand [kW] (bhp)	1.293 (1.8)	1.294 (1.8)	
TSP [in. w.g.]	3.3	3.4	
Economizer	Same as baseline	Yes, drybulb	
Heat recovery	Yes, enthalpy wheel	None	
System 16	***EL1 Sys1 PSZ (G.C16)***	***HVAC System 16***	
Cooling Cap [kBtu/h] (tons)	352.290 (30)	354.745 (30)	
Cooling Efficiency	Same as baseline	9.0 EER	
Heating Cap [kBtu/h]	290.410	292.433	
Heating Efficiency	Same as baseline	3.1 COP	
Design Airflow [cfm]	Same as baseline	8288	
Fan Demand [kW] (bhp)	5.041 (6.8)	5.048 (6.8)	
TSP [in. w.g.]	Same as baseline	2.8	
Economizer	Same as baseline	Yes, drybulb	
Heat recovery	Yes, enthalpy wheel	None	
System 17	***EL1 Sys1 PSZ (G.N17)***	***HVAC System 17***	
Cooling Cap [kBtu/h] (tons)	137.910 (12)	138.138 (12)	
Cooling Efficiency	Same as baseline	9.3 EER	
Heating Cap [kBtu/h]	110.028	110.210	
Heating Efficiency	Same as baseline	3.1 COP	
Design Airflow [cfm]	Same as baseline	2589	
Fan Demand [kW] (bhp)	1.774 (2.4)	1.772 (2.4)	
TSP [in. w.g.]	Same as baseline	3.2	
Economizer	Same as baseline	Yes, drybulb	
Heat recovery	Yes, enthalpy wheel	None	

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
Envelope			
Wall Assembly	Same as baseline	R-13 + R-3.8 c.i., U =0.084 Gross Area: 13540 sf Net Area: 11100 sf	
Roof Assembly	R-17 entirely above deck Gross Area: 50000 sf	R-15 entirely above deck Gross Area: 50000 sf	
Window Assembly	Same as baseline	Generic glazing: U-0.57; SHGC-0.39; VLT-0.81 Gross Area: 2440 sf	
Interior Loads			
Lighting	Same as baseline	LPD = 1.2 W/sf	T-8 lamps for both cases
Daylighting Controls	None	None	
HVAC Systems	Packaged Single Zone Heat Pumps	Packaged Single Zone Heat Pumps	
System 1	***EL1 Sys1 PSZ (G.NW1)***	***HVAC System 1***	
Cooling Cap [kBtu/h] (tons)	41.358 (4)	41.473 (4)	
Cooling Efficiency	Same as baseline	13.0 SEER	
Heating Cap [kBtu/h]	36.093	36.193	
Heating Efficiency	Same as baseline	7.7 HSPF	
Design Airflow [cfm]	Same as baseline	987	
Fan Demand [kW] (bhp)	Same as baseline	0.728 (1.0)	
TSP [in. w.g.]	Same as baseline	3.5	
Economizer	Same as baseline	Yes, drybulb	
Heat recovery	Yes, enthalpy wheel	None	
System 2	***EL1 Sys1 PSZ (G.W2)***	***HVAC System 2***	
Cooling Cap [kBtu/h] (tons)	126.365 (11)	126.702 (11)	
Cooling Efficiency	Same as baseline	10.1 EER	
Heating Cap [kBtu/h]	100.818	101.086	
Heating Efficiency	Same as baseline	3.2 COP	
Design Airflow [cfm]	Same as baseline	2983	
Fan Demand [kW] (bhp)	Same as baseline	1.987 (2.7)	
TSP [in. w.g.]	Same as baseline	3.2	
Economizer	Same as baseline	Yes, drybulb	
Heat recovery	Yes, enthalpy wheel	None	

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
System 3	***EL1 Sys1 PSZ (G.SSW3)***	***HVAC System 3***	
Cooling Cap [kBtu/h] (tons)	129.368 (11)	129.757 (11)	
Cooling Efficiency	Same as baseline	10.1 EER	
Heating Cap [kBtu/h]	103.213	103.524	
Heating Efficiency	Same as baseline	3.2 COP	
Design Airflow [cfm]	Same as baseline	3186	
Fan Demand [kW] (bhp)	Same as baseline	2.115 (2.9)	
TSP [in. w.g.]	Same as baseline	3.2	
Economizer	Same as baseline	Yes, drybulb	
Heat recovery	Yes, enthalpy wheel	None	
System 4	***EL1 Sys1 PSZ (G.S4)***	***HVAC System 4***	
Cooling Cap [kBtu/h] (tons)	128.120 (11)	128.504 (11)	
Cooling Efficiency	Same as baseline	10.1 EER	
Heating Cap [kBtu/h]	102.217	102.524	
Heating Efficiency	Same as baseline	3.2 COP	
Design Airflow [cfm]	Same as baseline	3150	
Fan Demand [kW] (bhp)	Same as baseline	2.098 (2.9)	
TSP [in. w.g.]	Same as baseline	3.2	
Economizer	Same as baseline	Yes, drybulb	
Heat recovery	Yes, enthalpy wheel	None	
System 5	***EL1 Sys1 PSZ (G.N5)***	***HVAC System 5***	
Cooling Cap [kBtu/h] (tons)	104.650 (9)	104.910 (9)	
Cooling Efficiency	Same as baseline	10.1 EER	
Heating Cap [kBtu/h]	84.475	84.685	
Heating Efficiency	Same as baseline	3.2 COP	
Design Airflow [cfm]	Same as baseline	2429	
Fan Demand [kW] (bhp)	Same as baseline	1.659 (2.3)	
TSP [in. w.g.]	Same as baseline	3.3	
Economizer	Same as baseline	Yes, drybulb	
Heat recovery	Yes, enthalpy wheel	None	

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
System 6	***EL1 Sys1 PSZ (G.C6)***	***HVAC System 6***	
Cooling Cap [kBtu/h] (tons)	328.796 (28)	330.906 (28)	
Cooling Efficiency	Same as baseline	9.0 EER	
Heating Cap [kBtu/h]	271.042	272.781	
Heating Efficiency	Same as baseline	3.1 COP	
Design Airflow [cfm]	Same as baseline	8649	
Fan Demand [kW] (bhp)	Same as baseline	5.161 (7.0)	
TSP [in. w.g.]	Same as baseline	2.8	
Economizer	Same as baseline	Yes, drybulb	
Heat recovery	Yes, enthalpy wheel	None	
System 7	***EL1 Sys1 PSZ (G.N7)***	***HVAC System 7***	
Cooling Cap [kBtu/h] (tons)	111.009 (10)	111.286 (10)	
Cooling Efficiency	Same as baseline	10.1 EER	
Heating Cap [kBtu/h]	88.566	88.787	
Heating Efficiency	Same as baseline	3.2 COP	
Design Airflow [cfm]	Same as baseline	2581	
Fan Demand [kW] (bhp)	Same as baseline	1.735 (2.4)	
TSP [in. w.g.]	Same as baseline	3.2	
Economizer	Same as baseline	Yes, drybulb	
Heat recovery	Yes, enthalpy wheel	None	
System 8	***EL1 Sys1 PSZ (G.N8)***	***HVAC System 8***	
Cooling Cap [kBtu/h] (tons)	74.711 (7)	74.897 (7)	
Cooling Efficiency	Same as baseline	10.1 EER	
Heating Cap [kBtu/h]	60.308	60.458	
Heating Efficiency	Same as baseline	3.2 COP	
Design Airflow [cfm]	Same as baseline	1731	
Fan Demand [kW] (bhp)	Same as baseline	1.222 (1.7)	
TSP [in. w.g.]	Same as baseline	3.4	
Economizer	Same as baseline	Yes, drybulb	
Heat recovery	Yes, enthalpy wheel	None	

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
System 9	***EL1 Sys1 PSZ (G.NE9)***	***HVAC System 9***	
Cooling Cap [kBtu/h] (tons)	43.828 (4)	43.957 (4)	
Cooling Efficiency	Same as baseline	13.0 SEER	
Heating Cap [kBtu/h]	38.249	38.361	
Heating Efficiency	Same as baseline	7.7 HSPF	
Design Airflow [cfm]	Same as baseline	1074	
Fan Demand [kW] (bhp)	Same as baseline	0.790 (1.1)	
TSP [in. w.g.]	Same as baseline	3.5	
Economizer	Same as baseline	Yes, drybulb	
Heat recovery	Yes, enthalpy wheel	None	
System 10	***EL1 Sys1 PSZ (G.E10)***	***HVAC System 10***	
Cooling Cap [kBtu/h] (tons)	133.120 (12)	133.504 (12)	
Cooling Efficiency	Same as baseline	10.1 EER	
Heating Cap [kBtu/h]	106.207	106.513	
Heating Efficiency	Same as baseline	3.2 COP	
Design Airflow [cfm]	Same as baseline	3218	
Fan Demand [kW] (bhp)	Same as baseline	2.137 (2.9)	
TSP [in. w.g.]	Same as baseline	3.2	
Economizer	Same as baseline	Yes, drybulb	
Heat recovery	Yes, enthalpy wheel	None	
System 11	***EL1 Sys1 PSZ (G.SE11)***	***HVAC System 11***	
Cooling Cap [kBtu/h] (tons)	47.000 (4)	47.146 (4)	
Cooling Efficiency	Same as baseline	13.0 SEER	
Heating Cap [kBtu/h]	41.016	41.144	
Heating Efficiency	Same as baseline	7.7 HSPF	
Design Airflow [cfm]	Same as baseline	1188	
Fan Demand [kW] (bhp)	Same as baseline	0.869 (1.2)	
TSP [in. w.g.]	Same as baseline	3.5	
Economizer	Same as baseline	Yes, drybulb	
Heat recovery	Yes, enthalpy wheel	None	

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
System 12	***EL1 Sys1 PSZ (G.S12)***	***HVAC System 12***	
Cooling Cap [kBtu/h] (tons)	125.017 (11)	125.391 (11)	
Cooling Efficiency	Same as baseline	9.3 EER	
Heating Cap [kBtu/h]	99.742	100.040	
Heating Efficiency	Same as baseline	3.2 COP	
Design Airflow [cfm]	Same as baseline	3072	
Fan Demand [kW] (bhp)	Same as baseline	2.046 (2.8)	
TSP [in. w.g.]	Same as baseline	3.2	
Economizer	Same as baseline	Yes, drybulb	
Heat recovery	Yes, enthalpy wheel	None	
System 13	***EL1 Sys1 PSZ (G.S13)***	***HVAC System 13***	
Cooling Cap [kBtu/h] (tons)	111.274 (10)	111.609 (10)	
Cooling Efficiency	Same as baseline	10.1 EER	
Heating Cap [kBtu/h]	89.822	90.092	
Heating Efficiency	Same as baseline	3.2 COP	
Design Airflow [cfm]	Same as baseline	2736	
Fan Demand [kW] (bhp)	Same as baseline	1.834 (2.5)	
TSP [in. w.g.]	Same as baseline	3.2	
Economizer	Same as baseline	Yes, drybulb	
Heat recovery	Yes, enthalpy wheel	None	
System 14	***EL1 Sys1 PSZ (G.C14)***	***HVAC System 14***	
Cooling Cap [kBtu/h] (tons)	32.585 (3)	32.970 (3)	
Cooling Efficiency	Same as baseline	13.0 SEER	
Heating Cap [kBtu/h]	28.437	28.773	
Heating Efficiency	Same as baseline	7.7 HSPF	
Design Airflow [cfm]	Same as baseline	948	
Fan Demand [kW] (bhp)	Same as baseline	0.715 (1.0)	
TSP [in. w.g.]	Same as baseline	3.6	
Economizer	Same as baseline	Yes, drybulb	
Heat recovery	Yes, enthalpy wheel	None	

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
System 15	***EL1 Sys1 PSZ (G.C15)***	***HVAC System 15***	
Cooling Cap [kBtu/h] (tons)	78.024 (7)	78.304 (7)	
Cooling Efficiency	Same as baseline	10.1 EER	
Heating Cap [kBtu/h]	62.982	63.208	
Heating Efficiency	Same as baseline	3.2 COP	
Design Airflow [cfm]	Same as baseline	1835	
Fan Demand [kW] (bhp)	Same as baseline	1.292 (1.8)	
TSP [in. w.g.]	Same as baseline	3.3	
Economizer	Same as baseline	Yes, drybulb	
Heat recovery	Yes, enthalpy wheel	None	
System 16	***EL1 Sys1 PSZ (G.C16)***	***HVAC System 16***	
Cooling Cap [kBtu/h] (tons)	306.411 (26)	308.951 (26)	
Cooling Efficiency	Same as baseline	9.0 EER	
Heating Cap [kBtu/h]	252.589	254.683	
Heating Efficiency	Same as baseline	3.1 COP	
Design Airflow [cfm]	Same as baseline	8440	
Fan Demand [kW] (bhp)	Same as baseline	5.036 (6.8)	
TSP [in. w.g.]	Same as baseline	2.8	
Economizer	Same as baseline	Yes, drybulb	
Heat recovery	Yes, enthalpy wheel	None	
System 17	***EL1 Sys1 PSZ (G.N17)***	***HVAC System 17***	
Cooling Cap [kBtu/h] (tons)	111.009 (10)	111.286 (10)	
Cooling Efficiency	Same as baseline	10.1 EER	
Heating Cap [kBtu/h]	88.566	88.787	
Heating Efficiency	Same as baseline	3.2 COP	
Design Airflow [cfm]	Same as baseline	2581	
Fan Demand [kW] (bhp)	Same as baseline	1.735 (2.4)	
TSP [in. w.g.]	Same as baseline	3.2	
Economizer	Same as baseline	Yes, drybulb	
Heat recovery	Yes, enthalpy wheel	None	

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
Envelope			
Wall Assembly	Same as baseline	R-13 + R-3.8 c.i., U =0.084 Gross Area: 13540 sf Net Area: 11100 sf	
Roof Assembly	R-17 entirely above deck Gross Area: 50000 sf	R-15 entirely above deck Gross Area: 50000 sf	
Window Assembly	Same as baseline	Generic glazing: U-0.57; SHGC-0.39; VLT-0.81 Gross Area: 2440 sf	
Interior Loads			
Lighting	Same as baseline	LPD = 1.2 W/sf	T-8 lamps for both cases
Daylighting Controls	None	None	
HVAC Systems	Packaged Single Zone Heat Pumps	Packaged Single Zone Heat Pumps	
System 1	***EL1 Sys1 PSZ (G.NW1)***	***HVAC System 1***	
Cooling Cap [kBtu/h] (tons)	37.382 (4)	37.539 (4)	
Cooling Efficiency	Same as baseline	13.0 SEER	
Heating Cap [kBtu/h]	32.623	32.761	
Heating Efficiency	Same as baseline	7.7 HSPF	
Design Airflow [cfm]	Same as baseline	1135	
Fan Demand [kW] (bhp)	Same as baseline	0.785 (1.1)	
TSP [in. w.g.]	Same as baseline	3.5	
Economizer	Same as baseline	Yes, drybulb	
Heat recovery	Yes, enthalpy wheel	None	
System 2	***EL1 Sys1 PSZ (G.W2)***	***HVAC System 2***	
Cooling Cap [kBtu/h] (tons)	112.579 (10)	113.034 (10)	
Cooling Efficiency	Same as baseline	10.1 EER	
Heating Cap [kBtu/h]	89.818	90.182	
Heating Efficiency	Same as baseline	3.2 COP	
Design Airflow [cfm]	Same as baseline	3367	
Fan Demand [kW] (bhp)	Same as baseline	2.104 (2.9)	
TSP [in. w.g.]	Same as baseline	3.2	
Economizer	Same as baseline	Yes, drybulb	
Heat recovery	Yes, enthalpy wheel	None	

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
System 3	***EL1 Sys1 PSZ (G.SSW3)***	***HVAC System 3***	
Cooling Cap [kBtu/h] (tons)	114.928 (10)	115.437 (10)	
Cooling Efficiency	Same as baseline	10.1 EER	
Heating Cap [kBtu/h]	91.693	92.098	
Heating Efficiency	Same as baseline	3.2 COP	
Design Airflow [cfm]	Same as baseline	3547	
Fan Demand [kW] (bhp)	Same as baseline	2.209 (3.0)	
TSP [in. w.g.]	Same as baseline	3.2	
Economizer	Same as baseline	Yes, drybulb	
Heat recovery	Yes, enthalpy wheel	None	
System 4	***EL1 Sys1 PSZ (G.S4)***	***HVAC System 4***	
Cooling Cap [kBtu/h] (tons)	112.021 (10)	112.508 (10)	
Cooling Efficiency	Same as baseline	10.1 EER	
Heating Cap [kBtu/h]	89.373	89.762	
Heating Efficiency	Same as baseline	3.2 COP	
Design Airflow [cfm]	Same as baseline	3430	
Fan Demand [kW] (bhp)	Same as baseline	2.143 (2.9)	
TSP [in. w.g.]	Same as baseline	3.2	
Economizer	Same as baseline	Yes, drybulb	
Heat recovery	Yes, enthalpy wheel	None	
System 5	***EL1 Sys1 PSZ (G.N5)***	***HVAC System 5***	
Cooling Cap [kBtu/h] (tons)	89.814 (8)	90.139 (8)	
Cooling Efficiency	Same as baseline	10.1 EER	
Heating Cap [kBtu/h]	72.499	72.762	
Heating Efficiency	Same as baseline	3.2 COP	
Design Airflow [cfm]	Same as baseline	2616	
Fan Demand [kW] (bhp)	Same as baseline	1.676 (2.3)	
TSP [in. w.g.]	Same as baseline	3.3	
Economizer	Same as baseline	Yes, drybulb	
Heat recovery	Yes, enthalpy wheel	None	

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
System 6	***EL1 Sys1 PSZ (G.C6)***	***HVAC System 6***	
Cooling Cap [kBtu/h] (tons)	292.813 (25)	295.8 (25)	
Cooling Efficiency	Same as baseline	9.0 EER	
Heating Cap [kBtu/h]	241.379	243.842	
Heating Efficiency	Same as baseline	3.1 COP	
Design Airflow [cfm]	Same as baseline	9202	
Fan Demand [kW] (bhp)	Same as baseline	5.151 (6.9)	
TSP [in. w.g.]	Same as baseline	2.8	
Economizer	Same as baseline	Yes, drybulb	
Heat recovery	Yes, enthalpy wheel	None	
System 7	***EL1 Sys1 PSZ (G.N7)***	***HVAC System 7***	
Cooling Cap [kBtu/h] (tons)	95.309 (8)	95.656 (8)	
Cooling Efficiency	Same as baseline	10.1 EER	
Heating Cap [kBtu/h]	76.040	76.317	
Heating Efficiency	Same as baseline	3.2 COP	
Design Airflow [cfm]	Same as baseline	2780	
Fan Demand [kW] (bhp)	Same as baseline	1.753 (2.4)	
TSP [in. w.g.]	Same as baseline	3.2	
Economizer	Same as baseline	Yes, drybulb	
Heat recovery	Yes, enthalpy wheel	None	
System 8	***EL1 Sys1 PSZ (G.N8)***	***HVAC System 8***	
Cooling Cap [kBtu/h] (tons)	64.078 (6)	64.310 (6)	
Cooling Efficiency	Same as baseline	10.1 EER	
Heating Cap [kBtu/h]	51.725	51.912	
Heating Efficiency	Same as baseline	3.2 COP	
Design Airflow [cfm]	Same as baseline	1864	
Fan Demand [kW] (bhp)	Same as baseline	1.235 (1.7)	
TSP [in. w.g.]	Same as baseline	3.4	
Economizer	Same as baseline	Yes, drybulb	
Heat recovery	Yes, enthalpy wheel	None	

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
System 9	***EL1 Sys1 PSZ (G.NE9)***	***HVAC System 9***	
Cooling Cap [kBtu/h] (tons)	37.560 (4)	37.718 (4)	
Cooling Efficiency	Same as baseline	13.0 SEER	
Heating Cap [kBtu/h]	32.778	32.916	
Heating Efficiency	Same as baseline	7.7 HSPF	
Design Airflow [cfm]	Same as baseline	1140	
Fan Demand [kW] (bhp)	Same as baseline	0.786 (1.1)	
TSP [in. w.g.]	Same as baseline	3.5	
Economizer	Same as baseline	Yes, drybulb	
Heat recovery	Yes, enthalpy wheel	None	
System 10	***EL1 Sys1 PSZ (G.E10)***	***HVAC System 10***	
Cooling Cap [kBtu/h] (tons)	116.090 (10)	116.575 (10)	
Cooling Efficiency	Same as baseline	10.1 EER	
Heating Cap [kBtu/h]	92.620	93.007	
Heating Efficiency	Same as baseline	3.2 COP	
Design Airflow [cfm]	Same as baseline	3502	
Fan Demand [kW] (bhp)	Same as baseline	2.181 (3.0)	
TSP [in. w.g.]	Same as baseline	3.2	
Economizer	Same as baseline	Yes, drybulb	
Heat recovery	Yes, enthalpy wheel	None	
System 11	***EL1 Sys1 PSZ (G.SE11)***	***HVAC System 11***	
Cooling Cap [kBtu/h] (tons)	40.836 (4)	41.017 (4)	
Cooling Efficiency	Same as baseline	13.0 SEER	
Heating Cap [kBtu/h]	35.637	35.795	
Heating Efficiency	Same as baseline	7.7 HSPF	
Design Airflow [cfm]	Same as baseline	1274	
Fan Demand [kW] (bhp)	Same as baseline	0.874 (1.2)	
TSP [in. w.g.]	Same as baseline	3.5	
Economizer	Same as baseline	Yes, drybulb	
Heat recovery	Yes, enthalpy wheel	None	

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
System 12	***EL1 Sys1 PSZ (G.S12)***	***HVAC System 12***	
Cooling Cap [kBtu/h] (tons)	109.301 (10)	109.775 (10)	
Cooling Efficiency	Same as baseline	10.1 EER	
Heating Cap [kBtu/h]	87.203	100.040	
Heating Efficiency	Same as baseline	3.2 COP	
Design Airflow [cfm]	Same as baseline	3345	
Fan Demand [kW] (bhp)	Same as baseline	2.090 (2.8)	
TSP [in. w.g.]	Same as baseline	3.2	
Economizer	Same as baseline	Yes, drybulb	
Heat recovery	Yes, enthalpy wheel	None	
System 13	***EL1 Sys1 PSZ (G.S13)***	***HVAC System 13***	
Cooling Cap [kBtu/h] (tons)	97.285 (9)	97.708 (9)	
Cooling Efficiency	Same as baseline	10.1 EER	
Heating Cap [kBtu/h]	78.530	78.872	
Heating Efficiency	Same as baseline	3.2 COP	
Design Airflow [cfm]	Same as baseline	2979	
Fan Demand [kW] (bhp)	Same as baseline	1.873 (2.6)	
TSP [in. w.g.]	Same as baseline	3.2	
Economizer	Same as baseline	Yes, drybulb	
Heat recovery	Yes, enthalpy wheel	None	
System 14	***EL1 Sys1 PSZ (G.C14)***	***HVAC System 14***	
Cooling Cap [kBtu/h] (tons)	30.247 (3)	30.774 (3)	
Cooling Efficiency	Same as baseline	13.0 SEER	
Heating Cap [kBtu/h]	26.396	26.856	
Heating Efficiency	Same as baseline	7.7 HSPF	
Design Airflow [cfm]	Same as baseline	1008	
Fan Demand [kW] (bhp)	Same as baseline	0.713 (1.0)	
TSP [in. w.g.]	Same as baseline	3.6	
Economizer	Same as baseline	Yes, drybulb	
Heat recovery	Yes, enthalpy wheel	None	

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
System 15	***EL1 Sys1 PSZ (G.C15)***	***HVAC System 15***	
Cooling Cap [kBtu/h] (tons)	65.662 (6)	66.081 (6)	
Cooling Efficiency	Same as baseline	10.1 EER	
Heating Cap [kBtu/h]	53.003	53.341	
Heating Efficiency	Same as baseline	3.2 COP	
Design Airflow [cfm]	Same as baseline	1952	
Fan Demand [kW] (bhp)	Same as baseline	1.289 (1.8)	
TSP [in. w.g.]	Same as baseline	3.3	
Economizer	Same as baseline	Yes, drybulb	
Heat recovery	Yes, enthalpy wheel	None	
System 16	***EL1 Sys1 PSZ (G.C16)***	***HVAC System 16***	
Cooling Cap [kBtu/h] (tons)	278.121 (24)	281.662 (24)	
Cooling Efficiency	Same as baseline	9.0 EER	
Heating Cap [kBtu/h]	229.269	232.188	
Heating Efficiency	Same as baseline	3.1 COP	
Design Airflow [cfm]	Same as baseline	8977	
Fan Demand [kW] (bhp)	Same as baseline	5.025 (6.8)	
TSP [in. w.g.]	Same as baseline	2.8	
Economizer	Same as baseline	Yes, drybulb	
Heat recovery	Yes, enthalpy wheel	None	
System 17	***EL1 Sys1 PSZ (G.N17)***	***HVAC System 17***	
Cooling Cap [kBtu/h] (tons)	95.309 (8)	95.656 (8)	
Cooling Efficiency	Same as baseline	10.1 EER	
Heating Cap [kBtu/h]	76.040	76.317	
Heating Efficiency	Same as baseline	3.2 COP	
Design Airflow [cfm]	Same as baseline	2780	
Fan Demand [kW] (bhp)	Same as baseline	1.753 (2.4)	
TSP [in. w.g.]	Same as baseline	3.2	
Economizer	Same as baseline	Yes, drybulb	
Heat recovery	Yes, enthalpy wheel	None	

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
Envelope			
Wall Assembly	Same as baseline	Gross Area: 21467 sf	
Roof Assembly	Same as baseline	Gross Area: 80000 sf	
Window Assembly	Solarban 70XL Starphire w/ thermally broken aluminum frame: U-0.402; SHGC-0.27; VLT-0.554	Generic glazing: U-0.57; SHGC-0.39; VLT-0.81	
Interior Loads			
Lighting	Same as baseline	ASHRAE 90.1 Space Dependent	
Daylighting Controls	None	None	
HVAC Systems	Packaged Single Zone Rooftop Units	Packaged Rooftop VAV w/ HW Reheat	
System 1	***EL1 Sys1 PSZ (G.NNE1)***	***HVAC System 1***	
Cooling Cap [kBtu/h] (tons)	83.418 (7)	1435.7 (120)	
Cooling Efficiency	11.0 EER	9.2 EER	
Heating Cap [kBtu/h]	81.799		
Heating Efficiency	2.4 COP		
Design Airflow [cfm]	1726	33095	
Fan Demand [kW] (bhp)	1.243 (1.67)	26.88 (36.0)	
TSP [in. w.g.]	3.3	4.5	
Economizer	Yes, drybulb	Yes, drybulb	
Heat recovery	Yes, enthalpy wheel	None	
Associated VAV Boxes	N/A	1 @ 2272 cfm, 76 kBtu/h htg 1 @ 1200 cfm, 40 kBtu/h htg 1 @ 3302 cfm, 110 kBtu/h htg 1 @ 2106 cfm, 70 kBtu/h htg 1 @ 2105 cfm, 70 kBtu/h htg 1 @ 2076 cfm, 69 kBtu/h htg 1 @ 1319 cfm, 44 kBtu/h htg 1 @ 1404 cfm, 53 kBtu/h htg 1 @ 2120 cfm, 80 kBtu/h htg 1 @ 4515 cfm, 169 kBtu/h htg 1 @ 4047 cfm, 135 kBtu/h htg 1 @ 3300 cfm, 110 kBtu/h htg 1 @ 3329 cfm, 111 kBtu/h htg	
System 2	***EL1 Sys1 PSZ (G.NW2)***	***HVAC System 2***	
Cooling Cap [kBtu/h] (tons)	47.083 (4)	883.429 (73.6)	
Cooling Efficiency	11.6 EER	9.2 EER	
Heating Cap [kBtu/h]	43.773		

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
Heating Efficiency	3.47 COP		
Design Airflow [cfm]	928	23204	
Fan Demand [kW] (bhp)	0.712 (0.954)	19.346 (25.9)	
TSP [in. w.g.]	3.7	4.7	
Economizer	Yes, drybulb	Yes, drybulb	
Heat recovery	Yes, enthalpy wheel	None	
Associated VAV Boxes	N/A	1 @ 3028 cfm, 101 kBtu/h htg 1 @ 7390 cfm, 246 kBtu/h htg 1 @ 12786 cfm, 479 kBtu/h htg	
System 3	***EL1 Sys1 PSZ (G.W3)***	***HVAC System 3***	
Cooling Cap [kBtu/h] (tons)	131.118 (11)	1298.557 (108)	
Cooling Efficiency	11.0 EER	9.2 EER	
Heating Cap [kBtu/h]	128.573		
Heating Efficiency	2.4 COP		
Design Airflow [cfm]	2589	30737	
Fan Demand [kW] (bhp)	1.776 (2.38)	25.059 (33.6)	
TSP [in. w.g.]	3.3	4.6	
Economizer	Yes, drybulb	Yes, drybulb	
Heat recovery	Yes, enthalpy wheel	None	
Associated VAV Boxes	N/A	1 @ 3476 cfm, 130 kBtu/h htg 1 @ 3136 cfm, 105 kBtu/h htg 1 @ 1433 cfm, 48 kBtu/h htg 1 @ 1907 cfm, 64 kBtu/h htg 1 @ 1341 cfm, 45 kBtu/h htg 1 @ 1790 cfm, 60 kBtu/h htg 1 @ 3880 cfm, 130 kBtu/h htg 1 @ 1202 cfm, 40 kBtu/h htg 1 @ 3713 cfm, 124 kBtu/h htg 1 @ 3711 cfm, 124 kBtu/h htg 1 @ 3743 cfm, 125 kBtu/h htg 1 @ 1404 cfm, 53 kBtu/h htg	
System 4	***EL1 Sys1 PSZ (G.E4)***		
Cooling Cap [kBtu/h] (tons)	78.679 (6.5)		
Cooling Efficiency	11.0 EER		
Heating Cap [kBtu/h]	77.152		
Heating Efficiency	2.4 COP		
Design Airflow [cfm]	1621		
Fan Demand [kW] (bhp)	1.171 (1.57)		

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
TSP [in. w.g.]	3.5		
Economizer	Yes, drybulb		
Heat recovery	Yes, enthalpy wheel		
Associated VAV Boxes	N/A		
System 5	***EL1 Sys1 PSZ (G.E5)***		
Cooling Cap [kBtu/h] (tons)	78.662 (6.56)		
Cooling Efficiency	11.0 EER		
Heating Cap [kBtu/h]	77.135		
Heating Efficiency	2.4 COP		
Design Airflow [cfm]	1620		
Fan Demand [kW] (bhp)	1.171 (1.57)		
TSP [in. w.g.]	3.5		
Economizer	Yes, drybulb		
Heat recovery	Yes, enthalpy wheel		
Associated VAV Boxes	N/A		
System 6	***EL1 Sys1 PSZ (G.E6)***		
Cooling Cap [kBtu/h] (tons)	40.973 (3.41)		
Cooling Efficiency	11.6 EER		
Heating Cap [kBtu/h]	38.093		
Heating Efficiency	3.48 COP		
Design Airflow [cfm]	1585		
Fan Demand [kW] (bhp)	1.179 (1.58)		
TSP [in. w.g.]	3.6		
Economizer	Yes, drybulb		
Heat recovery	Yes, enthalpy wheel		
Associated VAV Boxes	N/A		
System 7	***EL1 Sys1 PSZ (G.SW7)***		
Cooling Cap [kBtu/h] (tons)	48.922 (4.08)		
Cooling Efficiency	11.6 SEER		
Heating Cap [kBtu/h]	45.484		
Heating Efficiency	3.48		
Design Airflow [cfm]	989		
Fan Demand [kW] (bhp)	0.755 (1.01)		
TSP [in. w.g.]	3.7		
Economizer	Yes, drybulb		
Heat recovery	Yes, enthalpy wheel		
Associated VAV Boxes	N/A		

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
System 8	***EL1 Sys1 PSZ (G.N8)***		
Cooling Cap [kBtu/h] (tons)	119.122 (10)		
Cooling Efficiency	11.0 EER		
Heating Cap [kBtu/h]	116.81		
Heating Efficiency	2.4 COP		
Design Airflow [cfm]	2379		
Fan Demand [kW] (bhp)	1.662 (2.23)		
TSP [in. w.g.]	3.4		
Economizer	Yes, drybulb		
Heat recovery	Yes, enthalpy wheel		
Associated VAV Boxes	N/A		
System 9	***EL1 Sys1 PSZ (G.C9)***		
Cooling Cap [kBtu/h] (tons)	86.889 (7.24)		
Cooling Efficiency	11.0 EER		
Heating Cap [kBtu/h]	85.202		
Heating Efficiency	2.4 COP		
Design Airflow [cfm]	1404		
Fan Demand [kW] (bhp)	1.024 (1.37)		
TSP [in. w.g.]	3.5		
Economizer	Yes, drybulb		
Heat recovery	Yes, enthalpy wheel		
Associated VAV Boxes	N/A		
System 10	***EL1 Sys1 PSZ (G.C10)***		
Cooling Cap [kBtu/h] (tons)	115.631 (9.67)		
Cooling Efficiency	11.0 EER		
Heating Cap [kBtu/h]	113.387		
Heating Efficiency	2.4 COP		
Design Airflow [cfm]	1872		
Fan Demand [kW] (bhp)	1.326 (1.78)		
TSP [in. w.g.]	3.4		
Economizer	Yes, drybulb		
Heat recovery	Yes, enthalpy wheel		
Associated VAV Boxes	N/A		
System 11	***EL1 Sys1 PSZ (G.C11)***		
Cooling Cap [kBtu/h] (tons)	193.706 (16.2)		
Cooling Efficiency	10.8 EER		

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
Heating Cap [kBtu/h]	193.436		
Heating Efficiency	2.1 COP		
Design Airflow [cfm]	3612		
Fan Demand [kW] (bhp)	2.44 (3.27)		
TSP [in. w.g.]	3.2		
Economizer	Yes, drybulb		
Heat recovery	Yes, enthalpy wheel		
Associated VAV Boxes	N/A		
System 12	***EL1 Sys1 PSZ (G.C12)***		
Cooling Cap [kBtu/h] (tons)	164.885 (13.8)		
Cooling Efficiency	10.8 EER		
Heating Cap [kBtu/h]	164.655		
Heating Efficiency	2.1 COP		
Design Airflow [cfm]	2781		
Fan Demand [kW] (bhp)	1.901 (2.55)		
TSP [in. w.g.]	3.3		
Economizer	Yes, drybulb		
Heat recovery	Yes, enthalpy wheel		
Associated VAV Boxes	N/A		
System 13	***EL1 Sys1 PSZ (G.S13)***		
Cooling Cap [kBtu/h] (tons)	140.056 (11.8)		
Cooling Efficiency	10.8 EER		
Heating Cap [kBtu/h]	139.860		
Heating Efficiency	2.1 COP		
Design Airflow [cfm]	3045		
Fan Demand [kW] (bhp)	2.067 (2.77)		
TSP [in. w.g.]	3.3		
Economizer	Yes, drybulb		
Heat recovery	Yes, enthalpy wheel		
Associated VAV Boxes	N/A		
System 14	***EL1 Sys1 PSZ (G.S14)***		
Cooling Cap [kBtu/h] (tons)	77.724 (6.5)		
Cooling Efficiency	11.0 EER		
Heating Cap [kBtu/h]	76.215		
Heating Efficiency	2.4 COP		
Design Airflow [cfm]	2311		

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
Fan Demand [kW] (bhp)	1.637 (2.19)		
TSP [in. w.g.]	3.4		
Economizer	Yes, drybulb		
Heat recovery	Yes, enthalpy wheel		
Associated VAV Boxes	N/A		
System 15	***EL1 Sys1 PSZ (G.SE15)***		
Cooling Cap [kBtu/h] (tons)	51.4 (4.28)		
Cooling Efficiency	11.6 EER		
Heating Cap [kBtu/h]	47.788		
Heating Efficiency	3.48 COP		
Design Airflow [cfm]	1056		
Fan Demand [kW] (bhp)	0.802 (1.08)		
TSP [in. w.g.]	3.6		
Economizer	Yes, drybulb		
Heat recovery	Yes, enthalpy wheel		
Associated VAV Boxes	N/A		
System 16	***EL1 Sys1 PSZ (G.W16)***		
Cooling Cap [kBtu/h] (tons)	131.228 (11.0)		
Cooling Efficiency	11.0 EER		
Heating Cap [kBtu/h]	128.681		
Heating Efficiency	2.4 COP		
Design Airflow [cfm]	2588		
Fan Demand [kW] (bhp)	1.802 (2.42)		
TSP [in. w.g.]	3.3		
Economizer	Yes, drybulb		
Heat recovery	Yes, enthalpy wheel		
Associated VAV Boxes	N/A		
System 17	***EL1 Sys1 PSZ (G.W17)***		
Cooling Cap [kBtu/h] (tons)	131.905 (11.0)		
Cooling Efficiency	11.0 EER		
Heating Cap [kBtu/h]	131.720		
Heating Efficiency	2.4 COP		
Design Airflow [cfm]	2611		
Fan Demand [kW] (bhp)	1.789 (2.40)		
TSP [in. w.g.]	3.3		
Economizer	Yes, drybulb		

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
Heat recovery	Yes, enthalpy wheel		
Associated VAV Boxes	N/A		
System 18	***EL1 Sys1 PSZ (G.NNW18)***		
Cooling Cap [kBtu/h] (tons)	71.129 (6.0)		
Cooling Efficiency	11.0 EER		
Heating Cap [kBtu/h]	69.748		
Heating Efficiency	2.4 COP		
Design Airflow [cfm]	1478		
Fan Demand [kW] (bhp)	1.074 (1.44)		
TSP [in. w.g.]	3.5		
Economizer	Yes, drybulb		
Heat recovery	Yes, enthalpy wheel		
Associated VAV Boxes	N/A		
System 19	***EL1 Sys1 PSZ (G.NE19)***		
Cooling Cap [kBtu/h] (tons)	49.671 (4.17)		
Cooling Efficiency	11.6 EER		
Heating Cap [kBtu/h]	46.180		
Heating Efficiency	3.48 COP		
Design Airflow [cfm]	1005		
Fan Demand [kW] (bhp)	0.765 (1.03)		
TSP [in. w.g.]	3.7		
Economizer	Yes, drybulb		
Heat recovery	Yes, enthalpy wheel		
Associated VAV Boxes	N/A		
System 20	***EL1 Sys1 PSZ (G.W20)***		
Cooling Cap [kBtu/h] (tons)	68.812 (5.8)		
Cooling Efficiency	11.0 EER		
Heating Cap [kBtu/h]	67.476		
Heating Efficiency	2.4 COP		
Design Airflow [cfm]	1414		
Fan Demand [kW] (bhp)	1.031 (1.38)		
TSP [in. w.g.]	3.5		
Economizer	Yes, drybulb		
Heat recovery	Yes, enthalpy wheel		
Associated VAV Boxes	N/A		
System 21	***EL1 Sys1 PSZ (G.W21)***		

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
Cooling Cap [kBtu/h] (tons)	156.280 (13.1)		
Cooling Efficiency	10.8 EER		
Heating Cap [kBtu/h]	156.062		
Heating Efficiency	2.1 COP		
Design Airflow [cfm]	3069		
Fan Demand [kW] (bhp)	2.089 (2.80)		
TSP [in. w.g.]	3.3		
Economizer	Yes, drybulb		
Heat recovery	Yes, enthalpy wheel		
Associated VAV Boxes	N/A		
System 22	***EL1 Sys1 PSZ (G.W22)***		
Cooling Cap [kBtu/h] (tons)	24.474 (2.08)		
Cooling Efficiency	11.6 EER		
Heating Cap [kBtu/h]	22.753		
Heating Efficiency	3.48 COP		
Design Airflow [cfm]	943		
Fan Demand [kW] (bhp)	0.734 (0.984)		
TSP [in. w.g.]	3.7		
Economizer	Yes, drybulb		
Heat recovery	Yes, enthalpy wheel		
Associated VAV Boxes	N/A		
System 23	***EL1 Sys1 PSZ (G.E23)***		
Cooling Cap [kBtu/h] (tons)	138.562 (11.6)		
Cooling Efficiency	10.8 EER		
Heating Cap [kBtu/h]	138.368		
Heating Efficiency	2.1 COP		
Design Airflow [cfm]	2811		
Fan Demand [kW] (bhp)	1.916 (2.57)		
TSP [in. w.g.]	3.3		
Economizer	Yes, drybulb		
Heat recovery	Yes, enthalpy wheel		
Associated VAV Boxes	N/A		
System 24	***EL1 Sys1 PSZ (G.E24)***		
Cooling Cap [kBtu/h] (tons)	138.524 (11.6)		
Cooling Efficiency	10.8 EER		
Heating Cap [kBtu/h]	138.331		

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
Heating Efficiency	2.1 COP		
Design Airflow [cfm]	2810		
Fan Demand [kW] (bhp)	1.916 (2.57)		
TSP [in. w.g.]	3.3		
Economizer	Yes, drybulb		
Heat recovery	Yes, enthalpy wheel		
Associated VAV Boxes	N/A		
System 25	***EL1 Sys1 PSZ (G.E25)***		
Cooling Cap [kBtu/h] (tons)	139.687 (11.7)		
Cooling Efficiency	10.8 EER		
Heating Cap [kBtu/h]	139.491		
Heating Efficiency	2.1 COP		
Design Airflow [cfm]	2834		
Fan Demand [kW] (bhp)	1.932 (2.59)		
TSP [in. w.g.]	3.3		
Economizer	Yes, drybulb		
Heat recovery	Yes, enthalpy wheel		
Associated VAV Boxes	N/A		
System 26	***EL1 Sys1 PSZ (G.N26)***		
Cooling Cap [kBtu/h] (tons)	185.245 (15.5)		
Cooling Efficiency	10.8 EER		
Heating Cap [kBtu/h]	184.986		
Heating Efficiency	2.1 COP		
Design Airflow [cfm]	5912		
Fan Demand [kW] (bhp)	3.915 (5.25)		
TSP [in. w.g.]	3.2		
Economizer	Yes, drybulb		
Heat recovery	Yes, enthalpy wheel		
Associated VAV Boxes	N/A		
System 27	***EL1 Sys1 PSZ (G.C27)***		
Cooling Cap [kBtu/h] (tons)	478.813 (40)		
Cooling Efficiency	10.0 EER		
Heating Cap [kBtu/h]	516.427		
Heating Efficiency	2.1 COP		
Design Airflow [cfm]	10229		
Fan Demand [kW] (bhp)	6.003 (8.05)		

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
TSP [in. w.g.]	2.8		
Economizer	Yes, drybulb		
Heat recovery	Yes, enthalpy wheel		
Associated VAV Boxes	N/A		
System 28	***EL1 Sys1 PSZ (G.C28)***		
Cooling Cap [kBtu/h] (tons)	86.889 (7.3)		
Cooling Efficiency	11.0 EER		
Heating Cap [kBtu/h]	85.202		
Heating Efficiency	2.4 COP		
Design Airflow [cfm]	1404		
Fan Demand [kW] (bhp)	1.024 (1.37)		
TSP [in. w.g.]	3.5		
Economizer	Yes, drybulb		
Heat recovery	Yes, enthalpy wheel		
Associated VAV Boxes	N/A		

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
Envelope			
Wall Assembly	Same as baseline	Gross Area: 21467 sf	
Roof Assembly	Same as baseline	Gross Area: 80000 sf	
Window Assembly	Solarban 70XL Starphire w/ thermally broken aluminum frame: U-0.402; SHGC-0.27; VLT-0.554	Generic glazing: U-0.57; SHGC-0.39; VLT-0.81	
Interior Loads			
Lighting	Same as baseline	ASHRAE 90.1 Space Dependent	
Daylighting Controls	None	None	
HVAC Systems	Packaged Single Zone Rooftop Units	Packaged Rooftop VAV w/ HW Reheat	
System 1	***EL1 Sys1 PSZ (G.NNE1)***	***HVAC System 1***	
Cooling Cap [kBtu/h] (tons)	60.325 (5.1)	1071.425 (89.3)	
Cooling Efficiency	11.6 EER	9.2 EER	
Heating Cap [kBtu/h]	59.154		
Heating Efficiency	3.48 COP		
Design Airflow [cfm]	1690	33146	
Fan Demand [kW] (bhp)	1.194 (1.6)	26.414 (35.4)	
TSP [in. w.g.]	3.5	4.5	
Economizer	Yes, drybulb	Yes, drybulb	
Heat recovery	Yes, enthalpy wheel	None	
Associated VAV Boxes	N/A	1 @ 2201 cfm, 72 kBtu/h htg 1 @ 1183 cfm, 39 kBtu/h htg 1 @ 3303 cfm, 108 kBtu/h htg 1 @ 2086 cfm, 69 kBtu/h htg 1 @ 2085 cfm, 68 kBtu/h htg 1 @ 2052 cfm, 67 kBtu/h htg 1 @ 1311 cfm, 43 kBtu/h htg 1 @ 1431 cfm, 53 kBtu/h htg 1 @ 2159 cfm, 80 kBtu/h htg 1 @ 4600 cfm, 169 kBtu/h htg 1 @ 4102 cfm, 134 kBtu/h htg 1 @ 3302 cfm, 108 kBtu/h htg 1 @ 3331 cfm, 109 kBtu/h htg	
System 2	***EL1 Sys1 PSZ (G.NW2)***	***HVAC System 2***	
Cooling Cap [kBtu/h] (tons)	34.011 (2.92)	721.582 (60.2)	
Cooling Efficiency	11.6 EER	9.2 EER	
Heating Cap [kBtu/h]	31.620		

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
Heating Efficiency	3.48 COP		
Design Airflow [cfm]	916	23533	
Fan Demand [kW] (bhp)	0.690 (0.925)	19.249 (25.8)	
TSP [in. w.g.]	3.7	4.7	
Economizer	Yes, drybulb	Yes, drybulb	
Heat recovery	Yes, enthalpy wheel	None	
Associated VAV Boxes	N/A	1 @ 2978 cfm, 98 kBtu/h htg 1 @ 7532 cfm, 246 kBtu/h htg 1 @ 13022 cfm, 478 kBtu/h htg	
System 3	***EL1 Sys1 PSZ (G.W3)***	***HVAC System 3***	
Cooling Cap [kBtu/h] (tons)	96.019 (8.1)	970.696 (80.92)	
Cooling Efficiency	11.0 EER	9.2 EER	
Heating Cap [kBtu/h]	94.156		
Heating Efficiency	2.4 COP		
Design Airflow [cfm]	2601	30653	
Fan Demand [kW] (bhp)	1.750 (2.35)	24.518 (32.9)	
TSP [in. w.g.]	3.3	4.6	
Economizer	Yes, drybulb	Yes, drybulb	
Heat recovery	Yes, enthalpy wheel	None	
Associated VAV Boxes	N/A	1 @ 3539 cfm, 130 kBtu/h htg 1 @ 3176 cfm, 104 kBtu/h htg 1 @ 1419 cfm, 47 kBtu/h htg 1 @ 1885 cfm, 62 kBtu/h htg 1 @ 1304 cfm, 43 kBtu/h htg 1 @ 1803 cfm, 59 kBtu/h htg 1 @ 3911 cfm, 128 kBtu/h htg 1 @ 1212 cfm, 40 kBtu/h htg 1 @ 3648 cfm, 119 kBtu/h htg 1 @ 3647 cfm, 119 kBtu/h htg 1 @ 4678 cfm, 120 kBtu/h htg 1 @ 1431 cfm, 53 kBtu/h htg	
System 4	***EL1 Sys1 PSZ (G.E4)***		
Cooling Cap [kBtu/h] (tons)	57.483 (4.83)		
Cooling Efficiency	11.6 EER		
Heating Cap [kBtu/h]	56.368		
Heating Efficiency	3.48 COP		
Design Airflow [cfm]	1615		
Fan Demand [kW] (bhp)	1.145 (1.53)		

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
TSP [in. w.g.]	3.5		
Economizer	Yes, drybulb		
Heat recovery	Yes, enthalpy wheel		
Associated VAV Boxes	N/A		
System 5	***EL1 Sys1 PSZ (G.E5)***		
Cooling Cap [kBtu/h] (tons)	57.468 (4.83)		
Cooling Efficiency	11.6 EER		
Heating Cap [kBtu/h]	56.353		
Heating Efficiency	3.48 COP		
Design Airflow [cfm]	1614		
Fan Demand [kW] (bhp)	1.145 (1.53)		
TSP [in. w.g.]	3.5		
Economizer	Yes, drybulb		
Heat recovery	Yes, enthalpy wheel		
Associated VAV Boxes	N/A		
System 6	***EL1 Sys1 PSZ (G.E6)***		
Cooling Cap [kBtu/h] (tons)	38.866 (3.3)		
Cooling Efficiency	11.6 EER		
Heating Cap [kBtu/h]	36.134		
Heating Efficiency	3.48 COP		
Design Airflow [cfm]	1577		
Fan Demand [kW] (bhp)	1.151 (1.54)		
TSP [in. w.g.]	3.6		
Economizer	Yes, drybulb		
Heat recovery	Yes, enthalpy wheel		
Associated VAV Boxes	N/A		
System 7	***EL1 Sys1 PSZ (G.SW7)***		
Cooling Cap [kBtu/h] (tons)	35.634 (3.0)		
Cooling Efficiency	11.6 SEER		
Heating Cap [kBtu/h]	33.130		
Heating Efficiency	3.48 COP		
Design Airflow [cfm]	970		
Fan Demand [kW] (bhp)	0.726 (0.973)		
TSP [in. w.g.]	3.7		
Economizer	Yes, drybulb		
Heat recovery	Yes, enthalpy wheel		
Associated VAV Boxes	N/A		

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
System 8	***EL1 Sys1 PSZ (G.N8)***		
Cooling Cap [kBtu/h] (tons)	89.278 (7.5)		
Cooling Efficiency	11.0 EER		
Heating Cap [kBtu/h]	87.545		
Heating Efficiency	2.4 COP		
Design Airflow [cfm]	2360		
Fan Demand [kW] (bhp)	1.618 (2.17)		
TSP [in. w.g.]	3.4		
Economizer	Yes, drybulb		
Heat recovery	Yes, enthalpy wheel		
Associated VAV Boxes	N/A		
System 9	***EL1 Sys1 PSZ (G.C9)***		
Cooling Cap [kBtu/h] (tons)	58.972 (4.92)		
Cooling Efficiency	11.6 EER		
Heating Cap [kBtu/h]	57.827		
Heating Efficiency	3.48 COP		
Design Airflow [cfm]	1431		
Fan Demand [kW] (bhp)	1.024 (1.37)		
TSP [in. w.g.]	3.5		
Economizer	Yes, drybulb		
Heat recovery	Yes, enthalpy wheel		
Associated VAV Boxes	N/A		
System 10	***EL1 Sys1 PSZ (G.C10)***		
Cooling Cap [kBtu/h] (tons)	78.361 (6.6)		
Cooling Efficiency	11.0 EER		
Heating Cap [kBtu/h]	76.840		
Heating Efficiency	2.4 COP		
Design Airflow [cfm]	1908		
Fan Demand [kW] (bhp)	1.326 (1.78)		
TSP [in. w.g.]	3.4		
Economizer	Yes, drybulb		
Heat recovery	Yes, enthalpy wheel		
Associated VAV Boxes	N/A		
System 11	***EL1 Sys1 PSZ (G.C11)***		
Cooling Cap [kBtu/h] (tons)	143.338 (12)		
Cooling Efficiency	10.8 EER		

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
Heating Cap [kBtu/h]	143.138		
Heating Efficiency	2.1 COP		
Design Airflow [cfm]	3680		
Fan Demand [kW] (bhp)	2.439 (3.27)		
TSP [in. w.g.]	3.2		
Economizer	Yes, drybulb		
Heat recovery	Yes, enthalpy wheel		
Associated VAV Boxes	N/A		
System 12	***EL1 Sys1 PSZ (G.C12)***		
Cooling Cap [kBtu/h] (tons)	112.595 (9.42)		
Cooling Efficiency	11.0 EER		
Heating Cap [kBtu/h]	112.438		
Heating Efficiency	2.4 COP		
Design Airflow [cfm]	2832		
Fan Demand [kW] (bhp)	1.899 (2.55)		
TSP [in. w.g.]	3.3		
Economizer	Yes, drybulb		
Heat recovery	Yes, enthalpy wheel		
Associated VAV Boxes	N/A		
System 13	***EL1 Sys1 PSZ (G.S13)***		
Cooling Cap [kBtu/h] (tons)	105.979 (8.83)		
Cooling Efficiency	11.0 EER		
Heating Cap [kBtu/h]	105.831		
Heating Efficiency	2.4 COP		
Design Airflow [cfm]	3083		
Fan Demand [kW] (bhp)	2.053 (2.75)		
TSP [in. w.g.]	3.3		
Economizer	Yes, drybulb		
Heat recovery	Yes, enthalpy wheel		
Associated VAV Boxes	N/A		
System 14	***EL1 Sys1 PSZ (G.S14)***		
Cooling Cap [kBtu/h] (tons)	66.976 (5.6)		
Cooling Efficiency	11.0 EER		
Heating Cap [kBtu/h]	65.676		
Heating Efficiency	2.4 COP		
Design Airflow [cfm]	2337		

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
Fan Demand [kW] (bhp)	1.624 (2.18)		
TSP [in. w.g.]	3.4		
Economizer	Yes, drybulb		
Heat recovery	Yes, enthalpy wheel		
Associated VAV Boxes	N/A		
System 15	***EL1 Sys1 PSZ (G.SE15)***		
Cooling Cap [kBtu/h] (tons)	38.006 (3.3)		
Cooling Efficiency	11.6 EER		
Heating Cap [kBtu/h]	35.335		
Heating Efficiency	3.48 COP		
Design Airflow [cfm]	1044		
Fan Demand [kW] (bhp)	0.778 (1.04)		
TSP [in. w.g.]	3.6		
Economizer	Yes, drybulb		
Heat recovery	Yes, enthalpy wheel		
Associated VAV Boxes	N/A		
System 16	***EL1 Sys1 PSZ (G.W16)***		
Cooling Cap [kBtu/h] (tons)	96.146 (8.1)		
Cooling Efficiency	11.0 EER		
Heating Cap [kBtu/h]	94.279		
Heating Efficiency	2.4 COP		
Design Airflow [cfm]	2600		
Fan Demand [kW] (bhp)	1.776 (2.38)		
TSP [in. w.g.]	3.3		
Economizer	Yes, drybulb		
Heat recovery	Yes, enthalpy wheel		
Associated VAV Boxes	N/A		
System 17	***EL1 Sys1 PSZ (G.W17)***		
Cooling Cap [kBtu/h] (tons)	96.721 (8.1)		
Cooling Efficiency	11.0 EER		
Heating Cap [kBtu/h]	96.586		
Heating Efficiency	2.4 COP		
Design Airflow [cfm]	2623		
Fan Demand [kW] (bhp)	1.764 (2.36)		
TSP [in. w.g.]	3.3		
Economizer	Yes, drybulb		

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
Heat recovery	Yes, enthalpy wheel		
Associated VAV Boxes	N/A		
System 18	***EL1 Sys1 PSZ (G.NNW18)***		
Cooling Cap [kBtu/h] (tons)	52.219 (4.42)		
Cooling Efficiency	11.6 EER		
Heating Cap [kBtu/h]	51.205		
Heating Efficiency	3.48 COP		
Design Airflow [cfm]	1466		
Fan Demand [kW] (bhp)	1.045 (1.40)		
TSP [in. w.g.]	3.5		
Economizer	Yes, drybulb		
Heat recovery	Yes, enthalpy wheel		
Associated VAV Boxes	N/A		
System 19	***EL1 Sys1 PSZ (G.NE19)***		
Cooling Cap [kBtu/h] (tons)	36.122 (3.1)		
Cooling Efficiency	11.6 EER		
Heating Cap [kBtu/h]	33.583		
Heating Efficiency	3.48 COP		
Design Airflow [cfm]	981		
Fan Demand [kW] (bhp)	0.733 (0.983)		
TSP [in. w.g.]	3.7		
Economizer	Yes, drybulb		
Heat recovery	Yes, enthalpy wheel		
Associated VAV Boxes	N/A		
System 20	***EL1 Sys1 PSZ (G.W20)***		
Cooling Cap [kBtu/h] (tons)	51.295 (4.5)		
Cooling Efficiency	11.6 EER		
Heating Cap [kBtu/h]	50.299		
Heating Efficiency	3.48 COP		
Design Airflow [cfm]	1428		
Fan Demand [kW] (bhp)	1.021 (1.37)		
TSP [in. w.g.]	3.5		
Economizer	Yes, drybulb		
Heat recovery	Yes, enthalpy wheel		
Associated VAV Boxes	N/A		
System 21	***EL1 Sys1 PSZ (G.W21)***		

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
Cooling Cap [kBtu/h] (tons)	114.493 (9.6)		
Cooling Efficiency	11.0 EER		
Heating Cap [kBtu/h]	114.333		
Heating Efficiency	2.4 COP		
Design Airflow [cfm]	3101		
Fan Demand [kW] (bhp)	2.071 (2.78)		
TSP [in. w.g.]	3.3		
Economizer	Yes, drybulb		
Heat recovery	Yes, enthalpy wheel		
Associated VAV Boxes	N/A		
System 22	***EL1 Sys1 PSZ (G.W22)***		
Cooling Cap [kBtu/h] (tons)	23.664 (2.0)		
Cooling Efficiency	11.6 EER		
Heating Cap [kBtu/h]	22.001		
Heating Efficiency	3.48 COP		
Design Airflow [cfm]	953		
Fan Demand [kW] (bhp)	0.727 (0.975)		
TSP [in. w.g.]	3.7		
Economizer	Yes, drybulb		
Heat recovery	Yes, enthalpy wheel		
Associated VAV Boxes	N/A		
System 23	***EL1 Sys1 PSZ (G.E23)***		
Cooling Cap [kBtu/h] (tons)	101.178 (9.8)		
Cooling Efficiency	11.0 EER		
Heating Cap [kBtu/h]	101.037		
Heating Efficiency	2.4 COP		
Design Airflow [cfm]	2784		
Fan Demand [kW] (bhp)	1.862 (2.5)		
TSP [in. w.g.]	3.3		
Economizer	Yes, drybulb		
Heat recovery	Yes, enthalpy wheel		
Associated VAV Boxes	N/A		
System 24	***EL1 Sys1 PSZ (G.E24)***		
Cooling Cap [kBtu/h] (tons)	101.146 (8.5)		
Cooling Efficiency	11.0 EER		
Heating Cap [kBtu/h]	101.005		

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
Heating Efficiency	2.4 COP		
Design Airflow [cfm]	2783		
Fan Demand [kW] (bhp)	1.862 (2.5)		
TSP [in. w.g.]	3.3		
Economizer	Yes, drybulb		
Heat recovery	Yes, enthalpy wheel		
Associated VAV Boxes	N/A		
System 25	***EL1 Sys1 PSZ (G.E25)***		
Cooling Cap [kBtu/h] (tons)	102.014 (8.6)		
Cooling Efficiency	11.0 EER		
Heating Cap [kBtu/h]	101.871		
Heating Efficiency	2.4 COP		
Design Airflow [cfm]	2807		
Fan Demand [kW] (bhp)	1.877 (2.52)		
TSP [in. w.g.]	3.3		
Economizer	Yes, drybulb		
Heat recovery	Yes, enthalpy wheel		
Associated VAV Boxes	N/A		
System 26	***EL1 Sys1 PSZ (G.N26)***		
Cooling Cap [kBtu/h] (tons)	157.727 (13.2)		
Cooling Efficiency	10.8 EER		
Heating Cap [kBtu/h]	157.507		
Heating Efficiency	2.1 COP		
Design Airflow [cfm]	6026		
Fan Demand [kW] (bhp)	3.915 (5.25)		
TSP [in. w.g.]	3.2		
Economizer	Yes, drybulb		
Heat recovery	Yes, enthalpy wheel		
Associated VAV Boxes	N/A		
System 27	***EL1 Sys1 PSZ (G.C27)***		
Cooling Cap [kBtu/h] (tons)	376.211 (31.4)		
Cooling Efficiency	10.0 EER		
Heating Cap [kBtu/h]	405.764		
Heating Efficiency	2.1 COP		
Design Airflow [cfm]	10418		
Fan Demand [kW] (bhp)	5.998 (8.04)		

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
TSP [in. w.g.]	2.8		
Economizer	Yes, drybulb		
Heat recovery	Yes, enthalpy wheel		
Associated VAV Boxes	N/A		
System 28	***EL1 Sys1 PSZ (G.C28)***		
Cooling Cap [kBtu/h] (tons)	58.972 (4.92)		
Cooling Efficiency	11.6 EER		
Heating Cap [kBtu/h]	57.827		
Heating Efficiency	3.48 COP		
Design Airflow [cfm]	1431		
Fan Demand [kW] (bhp)	1.024 (1.37)		
TSP [in. w.g.]	3.5		
Economizer	Yes, drybulb		
Heat recovery	Yes, enthalpy wheel		
Associated VAV Boxes	N/A		

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
Envelope			
Wall Assembly	Same as baseline	Gross Area: 21467 sf	
Roof Assembly	Same as baseline	Gross Area: 80000 sf	
Window Assembly	Solarban 70XL Starphire w/ thermally broken aluminum frame: U-0.402; SHGC-0.27; VLT-0.554	Generic glazing: U-0.57; SHGC-0.39; VLT-0.81	
Interior Loads			
Lighting	Same as baseline	ASHRAE 90.1 Space Dependent	
Daylighting Controls	None	None	
HVAC Systems	Packaged Single Zone Rooftop Units	Packaged Rooftop VAV w/ HW Reheat	
System 1	***EL1 Sys1 PSZ (G.NNE1)***	***HVAC System 1***	
Cooling Cap [kBtu/h] (tons)	68.798 (5.8)	1209.401 (101)	
Cooling Efficiency	11.0 EER	9.2 EER	
Heating Cap [kBtu/h]	67.463		
Heating Efficiency	2.4 COP		
Design Airflow [cfm]	1811	35656	
Fan Demand [kW] (bhp)	1.200 (1.61)	26.653 (35.7)	
TSP [in. w.g.]	3.5	4.5	
Economizer	Yes, drybulb	Yes, drybulb	
Heat recovery	Yes, enthalpy wheel	None	
Associated VAV Boxes	N/A	1 @ 2362 cfm, 73 kBtu/h htg 1 @ 1282 cfm, 40 kBtu/h htg 1 @ 3528 cfm, 108 kBtu/h htg 1 @ 2257 cfm, 70 kBtu/h htg 1 @ 2256 cfm, 70 kBtu/h htg 1 @ 2232 cfm, 69 kBtu/h htg 1 @ 1465 cfm, 45 kBtu/h htg 1 @ 1526 cfm, 53 kBtu/h htg 1 @ 2296 cfm, 80 kBtu/h htg 1 @ 4899 cfm, 169 kBtu/h htg 1 @ 4468 cfm, 137 kBtu/h htg 1 @ 3526 cfm, 108 kBtu/h htg 1 @ 3557 cfm, 109 kBtu/h htg	
System 2	***EL1 Sys1 PSZ (G.NW2)***	***HVAC System 2***	
Cooling Cap [kBtu/h] (tons)	38.784 (3.3)	781.278 (65.2)	
Cooling Efficiency	11.6 EER	9.2 EER	
Heating Cap [kBtu/h]	36.058		

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
Heating Efficiency	3.47 COP		
Design Airflow [cfm]	975	25066	
Fan Demand [kW] (bhp)	0.688 (0.922)	19.233 (25.8)	
TSP [in. w.g.]	3.7	4.7	
Economizer	Yes, drybulb	Yes, drybulb	
Heat recovery	Yes, enthalpy wheel	None	
Associated VAV Boxes	N/A	1 @ 3178 cfm, 98 kBtu/h htg 1 @ 8030 cfm, 246 kBtu/h htg 1 @ 13858 cfm, 477 kBtu/h htg	
System 3	***EL1 Sys1 PSZ (G.W3)***	***HVAC System 3***	
Cooling Cap [kBtu/h] (tons)	109.149 (9.2)	1095.669 (91.3)	
Cooling Efficiency	11.0 EER	9.2 EER	
Heating Cap [kBtu/h]	107.030		
Heating Efficiency	2.4 COP		
Design Airflow [cfm]	2773	33072	
Fan Demand [kW] (bhp)	1.750 (2.35)	24.815 (33.3)	
TSP [in. w.g.]	3.3	4.6	
Economizer	Yes, drybulb	Yes, drybulb	
Heat recovery	Yes, enthalpy wheel	None	
Associated VAV Boxes	N/A	1 @ 3764 cfm, 130 kBtu/h htg 1 @ 3495 cfm, 107 kBtu/h htg 1 @ 1544 cfm, 48 kBtu/h htg 1 @ 2002 cfm, 62 kBtu/h htg 1 @ 1388 cfm, 43 kBtu/h htg 1 @ 1922 cfm, 59 kBtu/h htg 1 @ 4166 cfm, 128 kBtu/h htg 1 @ 1292 cfm, 40 kBtu/h htg 1 @ 3981 cfm, 122 kBtu/h htg 1 @ 3979 cfm, 122 kBtu/h htg 1 @ 4014 cfm, 123 kBtu/h htg 1 @ 1526 cfm, 53 kBtu/h htg	
System 4	***EL1 Sys1 PSZ (G.E4)***		
Cooling Cap [kBtu/h] (tons)	65.855 (5.5)		
Cooling Efficiency	11.0 EER		
Heating Cap [kBtu/h]	64.577		
Heating Efficiency	2.4 COP		
Design Airflow [cfm]	1736		
Fan Demand [kW] (bhp)	1.155 (1.55)		

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
TSP [in. w.g.]	3.5		
Economizer	Yes, drybulb		
Heat recovery	Yes, enthalpy wheel		
Associated VAV Boxes	N/A		
System 5	***EL1 Sys1 PSZ (G.E5)***		
Cooling Cap [kBtu/h] (tons)	65.848 (5.5)		
Cooling Efficiency	11.0 EER		
Heating Cap [kBtu/h]	64.570		
Heating Efficiency	2.4 COP		
Design Airflow [cfm]	1736		
Fan Demand [kW] (bhp)	1.155 (1.55)		
TSP [in. w.g.]	3.5		
Economizer	Yes, drybulb		
Heat recovery	Yes, enthalpy wheel		
Associated VAV Boxes	N/A		
System 6	***EL1 Sys1 PSZ (G.E6)***		
Cooling Cap [kBtu/h] (tons)	41.622 (3.5)		
Cooling Efficiency	11.6 EER		
Heating Cap [kBtu/h]	38.687		
Heating Efficiency	3.48 COP		
Design Airflow [cfm]	1703		
Fan Demand [kW] (bhp)	1.166 (1.56)		
TSP [in. w.g.]	3.6		
Economizer	Yes, drybulb		
Heat recovery	Yes, enthalpy wheel		
Associated VAV Boxes	N/A		
System 7	***EL1 Sys1 PSZ (G.SW7)***		
Cooling Cap [kBtu/h] (tons)	41.496 (3.5)		
Cooling Efficiency	11.6 SEER		
Heating Cap [kBtu/h]	38.579		
Heating Efficiency	3.48		
Design Airflow [cfm]	1078		
Fan Demand [kW] (bhp)	0.757 (1.01)		
TSP [in. w.g.]	3.7		
Economizer	Yes, drybulb		

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
Heat recovery	Yes, enthalpy wheel		
Associated VAV Boxes	N/A		
System 8	***EL1 Sys1 PSZ (G.N8)***		
Cooling Cap [kBtu/h] (tons)	99.974 (8.3)		
Cooling Efficiency	11.0 EER		
Heating Cap [kBtu/h]	98.033		
Heating Efficiency	2.4 COP		
Design Airflow [cfm]	2513		
Fan Demand [kW] (bhp)	1.616 (2.17)		
TSP [in. w.g.]	3.4		
Economizer	Yes, drybulb		
Heat recovery	Yes, enthalpy wheel		
Associated VAV Boxes	N/A		
System 9	***EL1 Sys1 PSZ (G.C9)***		
Cooling Cap [kBtu/h] (tons)	70.900 (5.92)		
Cooling Efficiency	11.0 EER		
Heating Cap [kBtu/h]	69.524		
Heating Efficiency	2.4 COP		
Design Airflow [cfm]	1526		
Fan Demand [kW] (bhp)	1.024 (1.37)		
TSP [in. w.g.]	3.5		
Economizer	Yes, drybulb		
Heat recovery	Yes, enthalpy wheel		
Associated VAV Boxes	N/A		
System 10	***EL1 Sys1 PSZ (G.C10)***		
Cooling Cap [kBtu/h] (tons)	94.262 (7.92)		
Cooling Efficiency	11.0 EER		
Heating Cap [kBtu/h]	92.432		
Heating Efficiency	2.4 COP		
Design Airflow [cfm]	2034		
Fan Demand [kW] (bhp)	1.326 (1.78)		
TSP [in. w.g.]	3.4		
Economizer	Yes, drybulb		
Heat recovery	Yes, enthalpy wheel		
Associated VAV Boxes	N/A		

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
System 11	***EL1 Sys1 PSZ (G.C11)***		
Cooling Cap [kBtu/h] (tons)	162.927 (13.6)		
Cooling Efficiency	10.8 EER		
Heating Cap [kBtu/h]	162.7		
Heating Efficiency	2.1 COP		
Design Airflow [cfm]	3919		
Fan Demand [kW] (bhp)	2.437 (3.27)		
TSP [in. w.g.]	3.2		
Economizer	Yes, drybulb		
Heat recovery	Yes, enthalpy wheel		
Associated VAV Boxes	N/A		
System 12	***EL1 Sys1 PSZ (G.C12)***		
Cooling Cap [kBtu/h] (tons)	134.191 (11.3)		
Cooling Efficiency	10.8 EER		
Heating Cap [kBtu/h]	134.004		
Heating Efficiency	2.1 COP		
Design Airflow [cfm]	3011		
Fan Demand [kW] (bhp)	1.894 (2.54)		
TSP [in. w.g.]	3.3		
Economizer	Yes, drybulb		
Heat recovery	Yes, enthalpy wheel		
Associated VAV Boxes	N/A		
System 13	***EL1 Sys1 PSZ (G.S13)***		
Cooling Cap [kBtu/h] (tons)	120.861 (10.1)		
Cooling Efficiency	11.0 EER		
Heating Cap [kBtu/h]	120.692		
Heating Efficiency	2.4 COP		
Design Airflow [cfm]	3356		
Fan Demand [kW] (bhp)	2.097 (2.81)		
TSP [in. w.g.]	3.3		
Economizer	Yes, drybulb		
Heat recovery	Yes, enthalpy wheel		
Associated VAV Boxes	N/A		
System 14	***EL1 Sys1 PSZ (G.S14)***		
Cooling Cap [kBtu/h] (tons)	74.113 (6.3)		
Cooling Efficiency	11.0 EER		

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
Heating Cap [kBtu/h]	72.675		
Heating Efficiency	2.4 COP		
Design Airflow [cfm]	2565		
Fan Demand [kW] (bhp)	1.672 (2.24)		
TSP [in. w.g.]	3.4		
Economizer	Yes, drybulb		
Heat recovery	Yes, enthalpy wheel		
Associated VAV Boxes	N/A		
System 15	***EL1 Sys1 PSZ (G.SE15)***		
Cooling Cap [kBtu/h] (tons)	43.627 (3.7)		
Cooling Efficiency	11.6 EER		
Heating Cap [kBtu/h]	40.561		
Heating Efficiency	3.48 COP		
Design Airflow [cfm]	1141		
Fan Demand [kW] (bhp)	0.798 (1.07)		
TSP [in. w.g.]	3.6		
Economizer	Yes, drybulb		
Heat recovery	Yes, enthalpy wheel		
Associated VAV Boxes	N/A		
System 16	***EL1 Sys1 PSZ (G.W16)***		
Cooling Cap [kBtu/h] (tons)	109.280 (9.2)		
Cooling Efficiency	11.0 EER		
Heating Cap [kBtu/h]	107.159		
Heating Efficiency	2.4 COP		
Design Airflow [cfm]	2772		
Fan Demand [kW] (bhp)	1.776 (2.38)		
TSP [in. w.g.]	3.3		
Economizer	Yes, drybulb		
Heat recovery	Yes, enthalpy wheel		
Associated VAV Boxes	N/A		
System 17	***EL1 Sys1 PSZ (G.W17)***		
Cooling Cap [kBtu/h] (tons)	109.872 (9.2)		
Cooling Efficiency	11.0 EER		
Heating Cap [kBtu/h]	109.719		
Heating Efficiency	2.4 COP		
Design Airflow [cfm]	2796		

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
Fan Demand [kW] (bhp)	1.764 (2.36)		
TSP [in. w.g.]	3.3		
Economizer	Yes, drybulb		
Heat recovery	Yes, enthalpy wheel		
Associated VAV Boxes	N/A		
System 18	***EL1 Sys1 PSZ (G.NNW18)***		
Cooling Cap [kBtu/h] (tons)	58.7 (4.92)		
Cooling Efficiency	11.6 EER		
Heating Cap [kBtu/h]	57.561		
Heating Efficiency	3.48 COP		
Design Airflow [cfm]	1555		
Fan Demand [kW] (bhp)	1.040 (1.39)		
TSP [in. w.g.]	3.5		
Economizer	Yes, drybulb		
Heat recovery	Yes, enthalpy wheel		
Associated VAV Boxes	N/A		
System 19	***EL1 Sys1 PSZ (G.NE19)***		
Cooling Cap [kBtu/h] (tons)	40.997 (3.42)		
Cooling Efficiency	11.6 EER		
Heating Cap [kBtu/h]	38.116		
Heating Efficiency	3.48 COP		
Design Airflow [cfm]	1050		
Fan Demand [kW] (bhp)	0.736 (0.987)		
TSP [in. w.g.]	3.7		
Economizer	Yes, drybulb		
Heat recovery	Yes, enthalpy wheel		
Associated VAV Boxes	N/A		
System 20	***EL1 Sys1 PSZ (G.W20)***		
Cooling Cap [kBtu/h] (tons)	57.939 (4.83)		
Cooling Efficiency	11.6 EER		
Heating Cap [kBtu/h]	56.815		
Heating Efficiency	3.48 COP		
Design Airflow [cfm]	1520		
Fan Demand [kW] (bhp)	1.020 (1.37)		
TSP [in. w.g.]	3.5		
Economizer	Yes, drybulb		

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
Heat recovery	Yes, enthalpy wheel		
Associated VAV Boxes	N/A		
System 21	***EL1 Sys1 PSZ (G.W21)***		
Cooling Cap [kBtu/h] (tons)	130.335 (10.92)		
Cooling Efficiency	11.0 EER		
Heating Cap [kBtu/h]	130.153		
Heating Efficiency	2.4 COP		
Design Airflow [cfm]	3300		
Fan Demand [kW] (bhp)	2.068 (2.77)		
TSP [in. w.g.]	3.3		
Economizer	Yes, drybulb		
Heat recovery	Yes, enthalpy wheel		
Associated VAV Boxes	N/A		
System 22	***EL1 Sys1 PSZ (G.W22)***		
Cooling Cap [kBtu/h] (tons)	24.798 (2.08)		
Cooling Efficiency	11.6 EER		
Heating Cap [kBtu/h]	23.055		
Heating Efficiency	3.48 COP		
Design Airflow [cfm]	1015		
Fan Demand [kW] (bhp)	0.727 (0.975)		
TSP [in. w.g.]	3.7		
Economizer	Yes, drybulb		
Heat recovery	Yes, enthalpy wheel		
Associated VAV Boxes	N/A		
System 23	***EL1 Sys1 PSZ (G.E23)***		
Cooling Cap [kBtu/h] (tons)	116.050 (9.8)		
Cooling Efficiency	11.0 EER		
Heating Cap [kBtu/h]	115.888		
Heating Efficiency	2.4 COP		
Design Airflow [cfm]	3011		
Fan Demand [kW] (bhp)	1.889 (2.53)		
TSP [in. w.g.]	3.3		
Economizer	Yes, drybulb		
Heat recovery	Yes, enthalpy wheel		
Associated VAV Boxes	N/A		
System 24	***EL1 Sys1 PSZ (G.E24)***		

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
(tons)	(9.8)		
Cooling Efficiency	11.0 EER		
Heating Cap [kBtu/h]	115.853		
Heating Efficiency	2.4 COP		
Design Airflow [cfm]	3009		
Fan Demand [kW] (bhp)	1.888 (2.53)		
TSP [in. w.g.]	3.3		
Economizer	Yes, drybulb		
Heat recovery	Yes, enthalpy wheel		
Associated VAV Boxes	N/A		
System 25	***EL1 Sys1 PSZ (G.E25)***		
Cooling Cap [kBtu/h] (tons)	116.999 (9.8)		
Cooling Efficiency	11.0 EER		
Heating Cap [kBtu/h]	116.835		
Heating Efficiency	2.4 COP		
Design Airflow [cfm]	3035		
Fan Demand [kW] (bhp)	1.904 (2.55)		
TSP [in. w.g.]	3.3		
Economizer	Yes, drybulb		
Heat recovery	Yes, enthalpy wheel		
Associated VAV Boxes	N/A		
System 26	***EL1 Sys1 PSZ (G.N26)***		
Cooling Cap [kBtu/h] (tons)	168.497 (14.1)		
Cooling Efficiency	10.8 EER		
Heating Cap [kBtu/h]	168.261		
Heating Efficiency	2.1 COP		
Design Airflow [cfm]	6424		
Fan Demand [kW] (bhp)	3.915 (5.25)		
TSP [in. w.g.]	3.2		
Economizer	Yes, drybulb		
Heat recovery	Yes, enthalpy wheel		
Associated VAV Boxes	N/A		
System 27	***EL1 Sys1 PSZ (G.C27)***		
Cooling Cap [kBtu/h] (tons)	416.126 (34.8)		
Cooling Efficiency	10.0 EER		
Heating Cap [kBtu/h]	448.814		
Heating Efficiency	2.1 COP		

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
Design Airflow [cfm]	11086		
Fan Demand [kW] (bhp)	5.988 (8.03)		
TSP [in. w.g.]	2.8		
Economizer	Yes, drybulb		
Heat recovery	Yes, enthalpy wheel		
Associated VAV Boxes	N/A		
System 28	***EL1 Sys1 PSZ (G.C28)***		
Cooling Cap [kBtu/h] (tons)	70.90 (5.92)		
Cooling Efficiency	11.0 EER		
Heating Cap [kBtu/h]	69.524		
Heating Efficiency	2.4 COP		
Design Airflow [cfm]	1526		
Fan Demand [kW] (bhp)	1.024 (1.37)		
TSP [in. w.g.]	3.5		
Economizer	Yes, drybulb		
Heat recovery	Yes, enthalpy wheel		
Associated VAV Boxes	N/A		

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
Envelope			
Wall Assembly	R-10 ci + R-10 ci (masonry wall) U-Value = 0.049 Gross Area: 15840 sf Net Area: 15820 sf	R-13 + R-3.8 ci U-Value = 0.084	
Roof Assembly	R-40 Entirely above deck Gross Area: 48000 sf	R-15 Entirely above deck U-Value = 0.063	
Window Assembly	Same as baseline Gross Area: 20 sf	Generic glazing: U-Value = 0.57 SHGC = 0.49 VT = 0.81	
Interior Loads			
Lighting	Same as baseline	Average 0.8 W/ft^2 in warehouse Average 1 W/ft^2 in office support spaces	
Daylighting Controls	None	None	
HVAC Systems	DX Split System Furnace and Gas-fired Unit Ventilators	Packaged Single Zone Rooftop Units and Gas-fired unit ventilators	
System 1	***EL1 Sys1 PSZ (G.SW1)***	***EL1 Sys1 PSZ (G.SW1)***	
Cooling Cap [kBtu/h] (tons)	19.715 (1.64)	25.585 (2.13)	
Cooling Efficiency	14 SEER	12 SEER	
Heating Cap [kBtu/h]	33.031	40.998	
Heating Efficiency	90%	80%	
Design Airflow [cfm]	554	614	
Fan Demand [kW] (bhp)	0.621 (0.84)	0.687 (0.93)	
TSP [in. w.g.]	5.0	5.0	
Economizer	Yes, drybulb	Yes, drybulb	
Heat recovery	None	None	
System 2	***EL1 Sys2 UVT (G.S2)***	***EL1 Sys2 UVT (G.S2)***	
Heating Cap [kBtu/h]	80.1	91.9	
Heating Efficiency	90%	80%	
Design Airflow [cfm]	1346	1346	
Fan Demand [kW] (bhp)	1.444 (1.95)	1.444 (1.95)	
TSP [in. w.g.]	3.1	3.1	

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
Economizer	None	None	
Heat recovery	None	None	
System 3	***EL1 Sys2 UVT (G.E3)***	***EL1 Sys2 UVT (G.E3)***	
Heating Cap [kBtu/h]	104.57	119.98	
Heating Efficiency	90%	80%	
Design Airflow [cfm]	1755	1755	
Fan Demand [kW] (bhp)	1.859 (2.51)	1.859 (2.51)	
TSP [in. w.g.]	3.1	3.1	
Economizer	None	None	
Heat recovery	None	None	
System 4	***EL1 Sys2 UVT (G.N4)***	***EL1 Sys2 UVT (G.N4)***	
Heating Cap [kBtu/h]	85.92	98.58	
Heating Efficiency	90%	80%	
Design Airflow [cfm]	1443	1443	
Fan Demand [kW] (bhp)	1.543 (2.09)	1.543 (2.09)	
TSP [in. w.g.]	3.1	3.1	
Economizer	None	None	
Heat recovery	None	None	
System 5	***EL1 Sys2 UVT (G.W5)***	***EL1 Sys2 UVT (G.W5)***	
Heating Cap [kBtu/h]	98.74	113.29	
Heating Efficiency	90%	80%	
Design Airflow [cfm]	1658	1658	
Fan Demand [kW] (bhp)	1.762 (2.38)	1.762 (2.38)	
TSP [in. w.g.]	3.1	3.1	
Economizer	None	None	
Heat recovery	None	None	
System 6	***EL1 Sys2 UVT (G.C6)***	***EL1 Sys2 UVT (G.C6)***	
Heating Cap [kBtu/h]	1110.83	1274.49	
Heating Efficiency	90%	80%	
Design Airflow [cfm]	18551	18551	
Fan Demand [kW] (bhp)	18.184 (24.57)	18.184 (24.57)	
TSP [in. w.g.]	3.1	3.1	
Economizer	None	None	
Heat recovery	None	None	

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
Envelope			
Wall Assembly	R-10 ci + R-10 ci (masonry wall) U-Value = 0.049 Gross Area: 15840 sf Net Area: 15820 sf	R-13 + R-3.8 ci U-Value = 0.084	
Roof Assembly	R-40 Entirely above deck Gross Area: 48000 sf	R-15 Entirely above deck U-Value = 0.063	
Window Assembly	Same as baseline Gross Area: 20 sf	Generic glazing: U-Value = 0.57 SHGC = 0.49 VT = 0.81	
Interior Loads			
Lighting	Same as baseline	Average 0.8 W/ft^2 in warehouse Average 1 W/ft^2 in office support spaces	
Daylighting Controls	None	None	
HVAC Systems	DX Split System Furnace and Gas-fired Unit Ventilators	Packaged Single Zone Rooftop Units and Gas-fired unit ventilators	
System 1	***EL1 Sys1 PSZ (G.SW1)***	***EL1 Sys1 PSZ (G.SW1)***	
Cooling Cap [kBtu/h] (tons)	18.705 (1.56)	25.245 (2.10)	
Cooling Efficiency	14 SEER	12 SEER	
Heating Cap [kBtu/h]	33.138	41.747	
Heating Efficiency	90%	80%	
Design Airflow [cfm]	551	621	
Fan Demand [kW] (bhp)	0.606 (0.82)	0.683 (0.92)	
TSP [in. w.g.]	5.0	5.0	
Economizer	Yes, drybulb	Yes, drybulb	
Heat recovery	None	None	
System 2	***EL1 Sys2 UVT (G.S2)***	***EL1 Sys2 UVT (G.S2)***	
Heating Cap [kBtu/h]	81.64	93.88	
Heating Efficiency	90%	80%	
Design Airflow [cfm]	1371	1371	
Fan Demand [kW] (bhp)	1.444 (1.95)	1.444 (1.95)	
TSP [in. w.g.]	3.1	3.1	

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
Economizer	None	None	
Heat recovery	None	None	
System 3	***EL1 Sys2 UVT (G.E3)***	***EL1 Sys2 UVT (G.E3)***	
Heating Cap [kBtu/h]	106.58	122.57	
Heating Efficiency	90%	80%	
Design Airflow [cfm]	1789	1789	
Fan Demand [kW] (bhp)	1.859 (2.51)	1.859 (2.51)	
TSP [in. w.g.]	3.1	3.1	
Economizer	None	None	
Heat recovery	None	None	
System 4	***EL1 Sys2 UVT (G.N4)***	***EL1 Sys2 UVT (G.N4)***	
Heating Cap [kBtu/h]	87.57	100.71	
Heating Efficiency	90%	80%	
Design Airflow [cfm]	1471	1471	
Fan Demand [kW] (bhp)	1.543 (2.09)	1.543 (2.09)	
TSP [in. w.g.]	3.1	3.1	
Economizer	None	None	
Heat recovery	None	None	
System 5	***EL1 Sys2 UVT (G.W5)***	***EL1 Sys2 UVT (G.W5)***	
Heating Cap [kBtu/h]	100.63	115.73	
Heating Efficiency	90%	80%	
Design Airflow [cfm]	1689	1689	
Fan Demand [kW] (bhp)	1.762 (2.38)	1.762 (2.38)	
TSP [in. w.g.]	3.1	3.1	
Economizer	None	None	
Heat recovery	None	None	
System 6	***EL1 Sys2 UVT (G.C6)***	***EL1 Sys2 UVT (G.C6)***	
Heating Cap [kBtu/h]	1132.07	1301.9	
Heating Efficiency	90%	80%	
Design Airflow [cfm]	18908	18908	
Fan Demand [kW] (bhp)	18.184 (24.57)	18.184 (24.57)	
TSP [in. w.g.]	3.1	3.1	
Economizer	None	None	
Heat recovery	None	None	

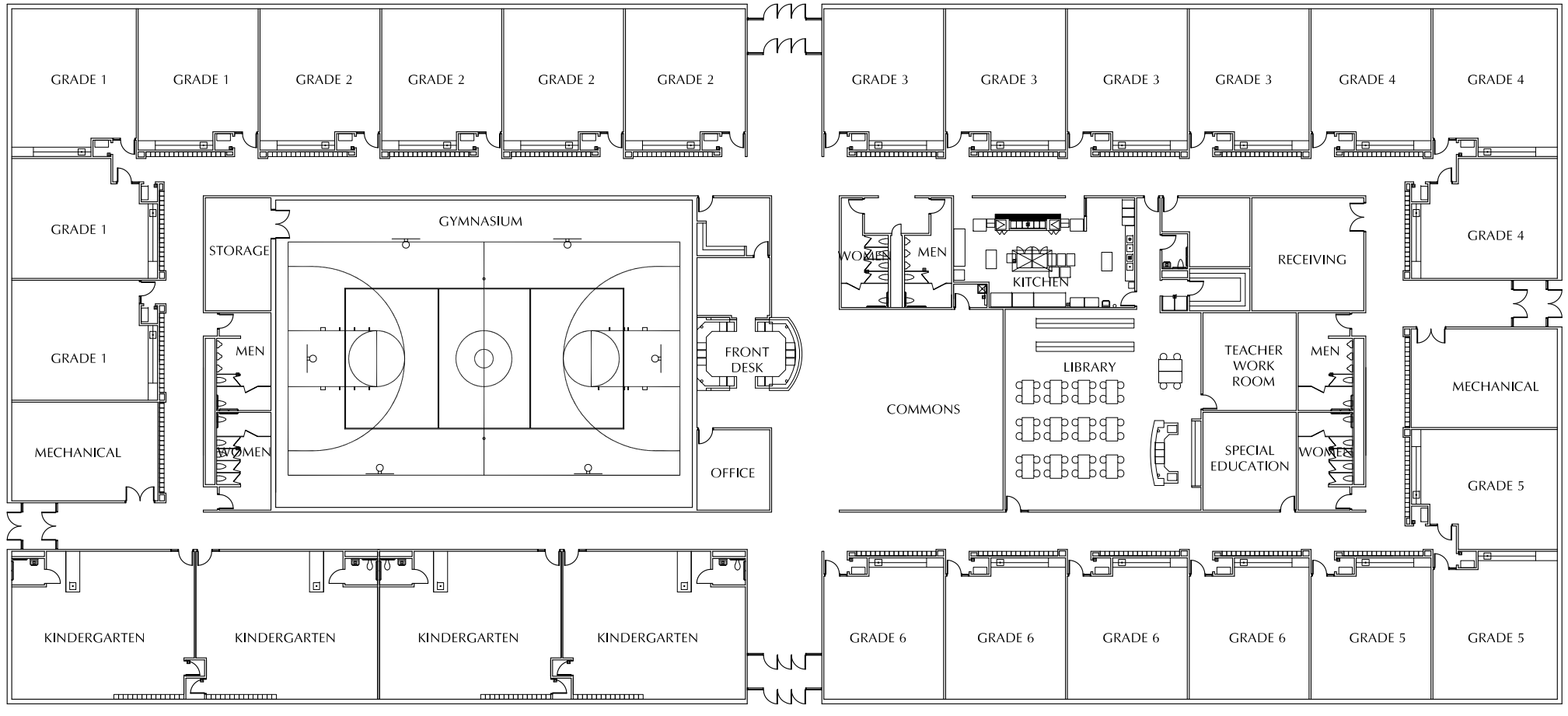
Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
Envelope			
Wall Assembly	R-10 ci + R-10 ci (masonry wall) U-Value = 0.049 Gross Area: 15840 sf Net Area: 15820 sf	R-13 + R-3.8 ci U-Value = 0.084	
Roof Assembly	R-40 Entirely above deck Gross Area: 48000 sf	R-15 Entirely above deck U-Value = 0.063	
Window Assembly	Same as baseline Gross Area: 20 sf	Generic glazing: U-Value = 0.57 SHGC = 0.49 VT = 0.81	
Interior Loads			
Lighting	Same as baseline	Average 0.8 W/ft^2 in warehouse Average 1 W/ft^2 in office support spaces	
Daylighting Controls	None	None	
HVAC Systems	DX Split System Furnace and Gas-fired Unit Ventilators	Packaged Single Zone Rooftop Units and Gas-fired unit ventilators	
System 1	***EL1 Sys1 PSZ (G.SW1)***	***EL1 Sys1 PSZ (G.SW1)***	
Cooling Cap [kBtu/h] (tons)	16.643 (1.39)	22.954 (1.91)	
Cooling Efficiency	14 SEER	12 SEER	
Heating Cap [kBtu/h]	34.728	43.789	
Heating Efficiency	90%	80%	
Design Airflow [cfm]	645	6725	
Fan Demand [kW] (bhp)	0.665 (0.90)	0.747 (1.01)	
TSP [in. w.g.]	5.0	5.0	
Economizer	Yes, drybulb	Yes, drybulb	
Heat recovery	None	None	
System 2	***EL1 Sys2 UVT (G.S2)***	***EL1 Sys2 UVT (G.S2)***	
Heating Cap [kBtu/h]	79.52	91.84	
Heating Efficiency	90%	80%	
Design Airflow [cfm]	1462	1462	
Fan Demand [kW] (bhp)	1.444 (1.95)	1.444 (1.95)	
TSP [in. w.g.]	3.1	3.1	

Component	Alternative Building	ASHRAE 90.1-2004 Baseline Building (0° Rotation)	Notes
Economizer	None	None	
Heat recovery	None	None	
System 3	***EL1 Sys2 UVT (G.E3)***	***EL1 Sys2 UVT (G.E3)***	
Heating Cap [kBtu/h]	104.26	119.91	
Heating Efficiency	90%	80%	
Design Airflow [cfm]	1907	1907	
Fan Demand [kW] (bhp)	1.859 (2.51)	1.859 (2.51)	
TSP [in. w.g.]	3.1	3.1	
Economizer	None	None	
Heat recovery	None	None	
System 4	***EL1 Sys2 UVT (G.N4)***	***EL1 Sys2 UVT (G.N4)***	
Heating Cap [kBtu/h]	85.67	98.52	
Heating Efficiency	90%	80%	
Design Airflow [cfm]	1568	1568	
Fan Demand [kW] (bhp)	1.543 (2.09)	1.543 (2.09)	
TSP [in. w.g.]	3.1	3.1	
Economizer	None	None	
Heat recovery	None	None	
System 5	***EL1 Sys2 UVT (G.W5)***	***EL1 Sys2 UVT (G.W5)***	
Heating Cap [kBtu/h]	98.45	113.22	
Heating Efficiency	90%	80%	
Design Airflow [cfm]	1801	1801	
Fan Demand [kW] (bhp)	1.762 (2.38)	1.762 (2.38)	
TSP [in. w.g.]	3.1	3.1	
Economizer	None	None	
Heat recovery	None	None	
System 6	***EL1 Sys2 UVT (G.C6)***	***EL1 Sys2 UVT (G.C6)***	
Heating Cap [kBtu/h]	1107.56	1273.73	
Heating Efficiency	90%	80%	
Design Airflow [cfm]	20156	20156	
Fan Demand [kW] (bhp)	18.184 (24.57)	18.184 (24.57)	
TSP [in. w.g.]	3.1	3.1	
Economizer	None	None	
Heat recovery	None	None	

NEBRASKA-SPECIFIC ADVANCED COMMERCIAL
BUILDING ENERGY CODE STUDY
LEO A DALY PROJECT # 002-10106-000
18 AUGUST 2009

ELEMENTARY EDUCATION BUILDING LAYOUT PLAN

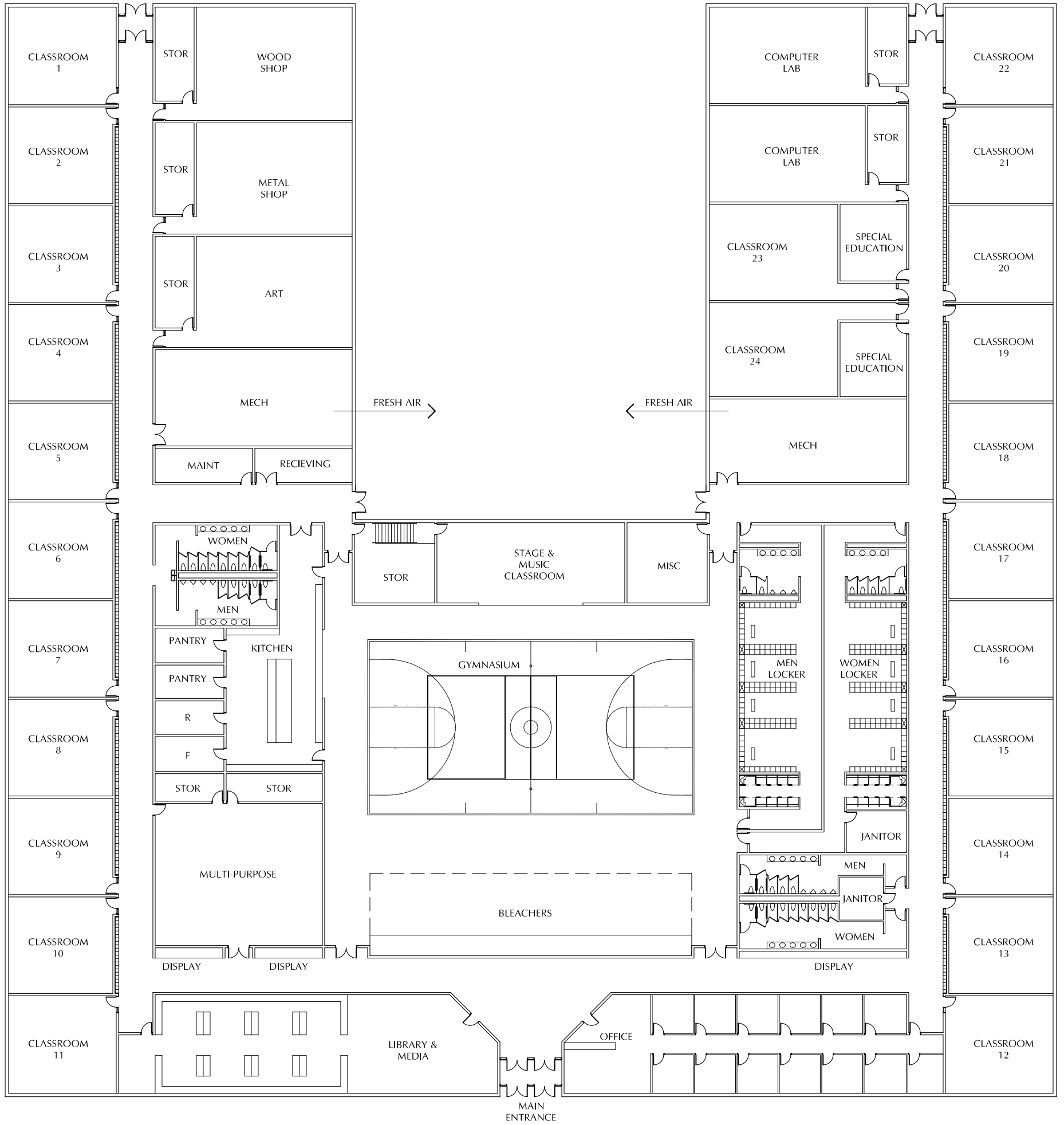
50,000SF = TOTAL BUILDING
35,000SF = 70% CLASSROOMS
10,000SF = 20% GYM/ CAFETERIA/ MULTI-PURPOSE
5,000SF = 10% LIBRARY/ MEDIA OFFICE



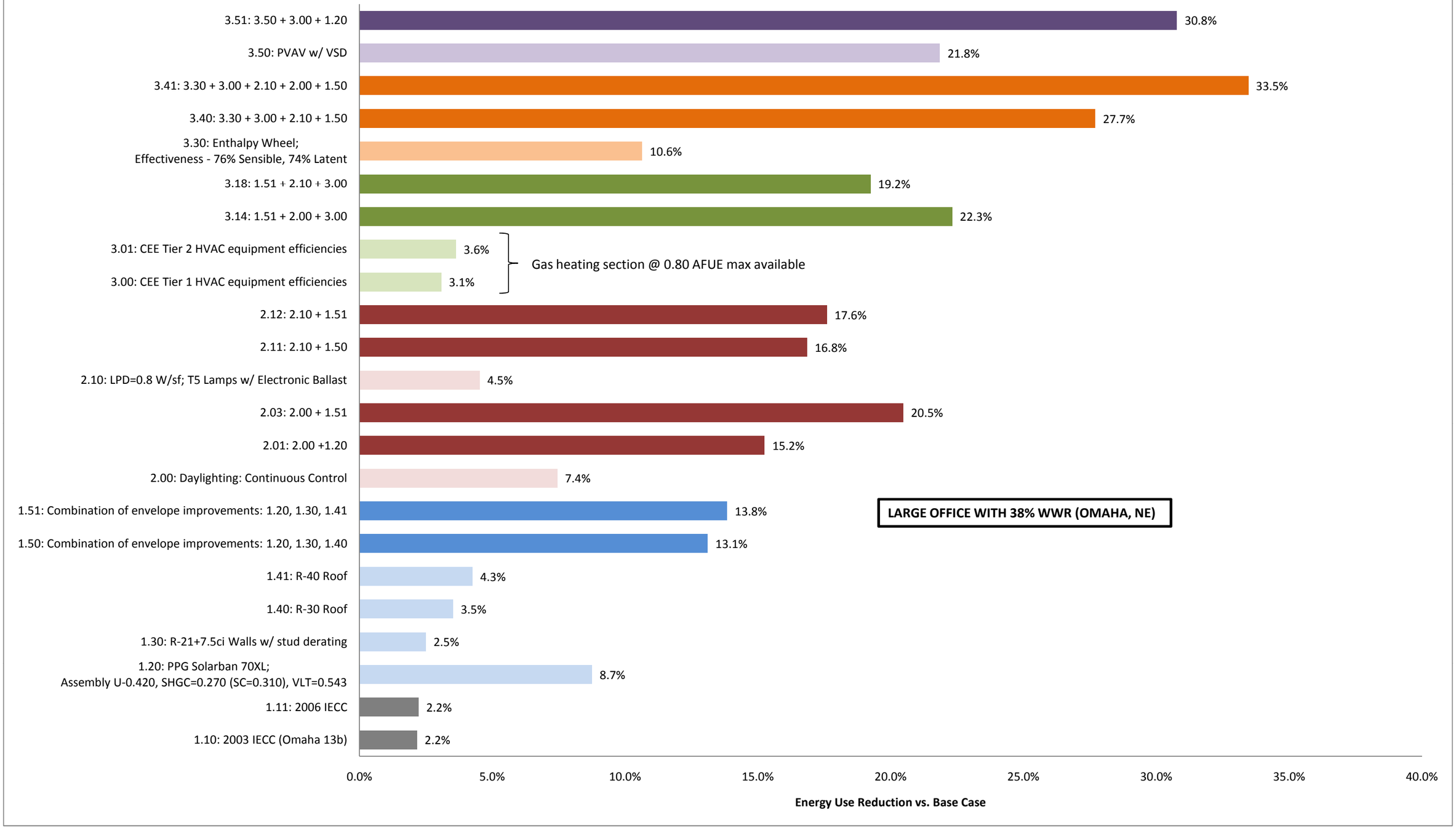
NEBRASKA-SPECIFIC ADVANCED COMMERCIAL
BUILDING ENERGY CODE STUDY
LEO A DALY PROJECT # 002-10106-000
18 AUGUST 2009

SECONDARY EDUCATION BUILDING LAYOUT PLAN

80,000SF = TOTAL BUILDING
56,000SF = 70% CLASSROOMS
16,000SF = 20% GYM LOCKERS/ CAFETERIA
8,000SF = 10% LIBRARY/ MEDIA OFFICE



Alternative Energy Savings vs. ASHRAE 90.1-2004 Base Case



Large Office 38% Glass Energy Results Summary
Omaha, NE

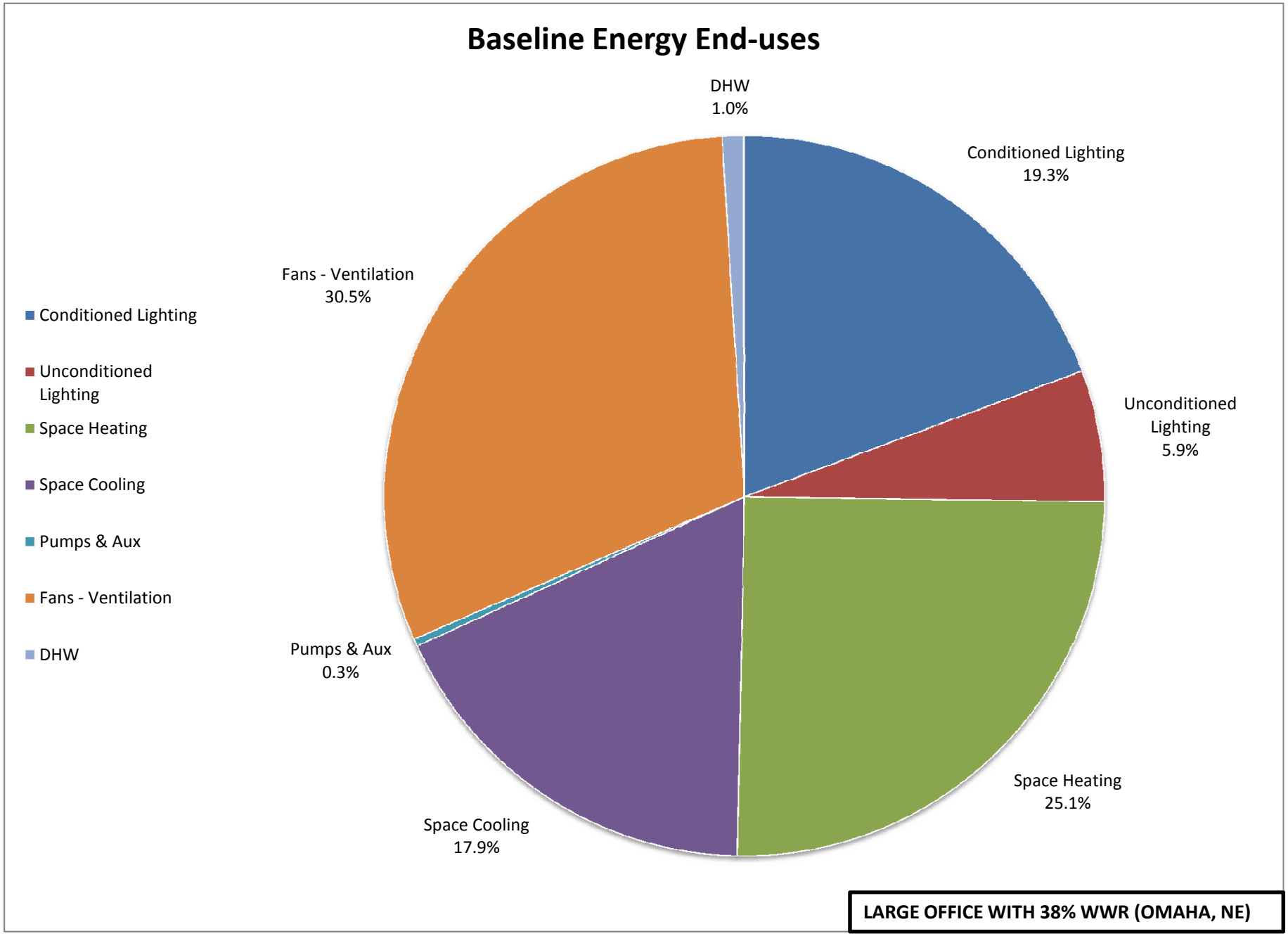
Run	Name	Annual Energy Use* [MMBtu]	Annual Energy Cost* [$]	Cost Savings vs. Avg. Base* [$]	Savings vs Avg. Base* [%]	Energy Use Reduction vs. Base* [MMBtu]	Energy Use Reduction vs. Base* [%]	Notes
0.00	Base Case	2973.5	$48,685					
	Base +90°	3027.2	$49,690					ASHRAE 90.1-2004 Baseline
	Base +180°	2967.8	$48,659					Appendix G
	Base +270°	3027.5	$49,686					Walls: U-0.084; Roof: U-0.063; Floors - U-0.052;
	Avg Base Case	2999.0	$49,180					Windows: U-0.57, SHGC-0.39
1.10	2003 IECC	2934.2	$48,502	$678	1.4%	64.80	2.2%	1.10: 2003 IECC (Omaha 13b)
1.11	2006 IECC	2932.4	$48,457	$723	1.5%	66.60	2.2%	1.11: 2006 IECC
1.20	Improved Fenestration	2736.6	$45,048	$4,132	8.4%	262.40	8.7%	1.20: PPG Solarban 70XL;
1.30	Improved Wall	2924.2	$48,195	$985	2.0%	74.80	2.5%	1.30: R-21+7.5ci Walls w/ stud
1.40	Improved Roof	2893.4	$47,840	$1,340	2.7%	105.60	3.5%	1.40: R-30 Roof
1.41	Improved Roof	2871.5	$47,609	$1,571	3.2%	127.50	4.3%	1.41: R-40 Roof
1.50	Composite Envelope	2605.9	$43,700	$5,480	11.1%	393.10	13.1%	1.50: Combination of envelope improvements: 1.20, 1.30, 1.40
1.51	Composite Envelope	2583.9	$43,472	$5,708	11.6%	415.10	13.8%	1.51: Combination of envelope
2.00	Daylighting controls	2775.7	$44,242	$4,938	10.0%	223.30	7.4%	2.00: Daylighting: Continuous Control
2.01	Daylighting controls	2541.7	$40,651	$8,528	17.3%	457.30	15.2%	2.01: 2.00 +1.20
2.02	Daylight w/ Comp. Envelope	2385.1	$39,031	$10,149	20.6%	613.90	20.5%	2.03: 2.00 + 1.51
2.10	Reduced LPD	2863.4	$46,236	$2,944	6.0%	135.60	4.5%	2.10: LPD=0.8 W/sf; T5 Lamps w/ Electronic Ballast
2.11	Reduced LPD	2493.8	$41,216	$7,964	16.2%	505.20	16.8%	2.11: 2.10 + 1.50
2.12	Reduced LPD	2471.4	$40,981	$8,199	16.7%	527.60	17.6%	2.12: 2.10 + 1.51
3.00	CEE Tier 1	2906.7	$47,182	$1,997	4.1%	92.30	3.1%	3.00: CEE Tier 1 HVAC
3.01	CEE Tier 2	2890.1	$46,804	$2,376	4.8%	108.90	3.6%	3.01: CEE Tier 2 HVAC
3.14	CEE Tier 1	2329.9	$37,780	$11,400	23.2%	669.10	22.3%	3.14: 1.51 + 2.00 + 3.00
3.18	CEE Tier 1	2422.1	$39,584	$9,595	19.5%	576.90	19.2%	3.18: 1.51 + 2.10 + 3.00

*Reported value excludes Misc Equipment electrical end-use

Large Office 38% Glass Energy Results Summary
Omaha, NE

Run	Name	Annual Energy Use* [MMBtu]	Annual Energy Cost* [$]	Cost Savings vs. Avg. Base* [$]	Savings vs Avg. Base* [%]	Energy Use Reduction vs. Base* [MMBtu]	Energy Use Reduction vs. Base* [%]	Notes
0.00	Base Case	2973.5	$48,685					
	Base +90°	3027.2	$49,690					ASHRAE 90.1-2004 Baseline Appendix G
	Base +180°	2967.8	$48,659					Walls: U-0.084; Roof: U-0.063;
	Base +270°	3027.5	$49,686					Floors - U-0.052;
	Avg Base Case	2999.0	$49,180					Windows: U-0.57, SHGC-0.39
3.30	Enthalpy Wheel	2679.9	$45,622	$3,557	7.2%	319.10	10.6%	3.30: Enthalpy Wheel; Effectiveness - 76% Sensible, 74% Latent
3.40	Enthalpy Wheel	2168.4	$37,178	$12,002	24.4%	830.60	27.7%	3.40: 3.30 + 3.00 + 2.10 + 1.50
3.41	Enthalpy Wheel	1995.5	$33,542	$15,638	31.8%	1003.50	33.5%	3.41: 3.30 + 3.00 + 2.10 + 2.00 + 1.50
3.50	VAV w/ VSD	2343.8	$48,884	$296	0.6%	655.20	21.8%	3.50: PVAV w/ VSD
3.51	VAV w/ VSD	2076.2	$43,227	$5,953	12.1%	922.80	30.8%	3.51: 3.50 + 3.00 + 1.20

*Reported value excludes Misc Equipment electrical end-use


Baseline Energy End-uses
DHW
1.0%
Conditioned Lighting
19.3%
Unconditioned
Lighting
5.9%
Space Heating
25.1%
Space Cooling
17.9%
Pumps & Aux
0.3%
Fans - Ventilation
30.5%
Conditioned Lighting
Unconditioned
Lighting
Space Heating
Space Cooling
Pumps & Aux
Fans - Ventilation
DHW
LARGE OFFICE WITH 38% WWR (OMAHA, NE)

Large Office 38% Glass Energy Results Summary
Omaha, NE

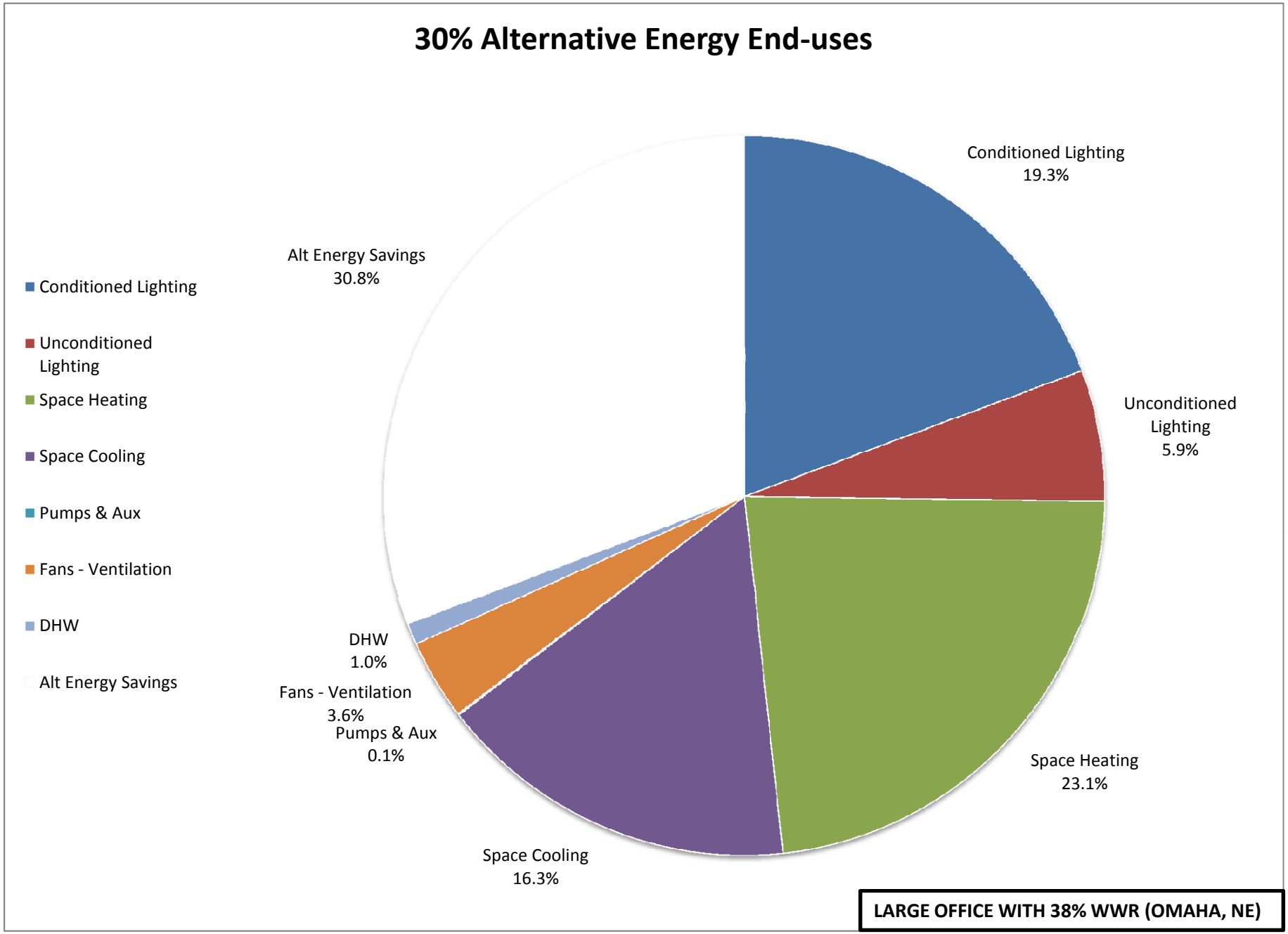
Building Energy Performance Summary - Base Case

End Use	*Energy Source*	*Baseline Building*		*Baseline Building +90*		*Baseline Building +180*		*Baseline Building +270*		Baseline Average		*% End Use of Baseline*
		Energy [MMbtu]	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	
Conditioned Lighting	Electricity	579.6	54.0	579.6	54.0	579.6	54.0	579.6	54.0	579.6	54.0	14.4%
Unconditioned Lighting	Electricity	176.6	12.0	176.6	12.0	176.6	12.0	176.6	12.0	176.6	12.0	4.4%
Misc Equipment	Electricity	1020.1	95.0	1020.1	95.0	1020.1	95.0	1020.1	95.0	1020.1	95.0	25.4%
Space Heating	Electricity									0.0	0.0	0.0%
Space Heating	Gas	761.7	17.0	747.2	17.0	754.1	17.0	747.6	17.0	752.7	17.0	18.7%
Space Heating	Steam/ HW									0.0	0.0	0.0%
Space Cooling	Electricity	525.2	174.0	546.6	178.3	524.0	173.7	546.7	178.1	535.6	176.0	13.3%
Space Cooling	CHW									0.0	0.0	0.0%
Heat Rejection	Electricity									0.0	0.0	0.0%
Pumps & Aux	Electricity	10.1	0.8	10.1	0.8	10.1	0.8	10.1	0.8	10.1	0.8	0.3%
Fans - Ventilation	Electricity	891.0	43.0	937.8	45.0	894.1	43.2	937.6	45.0	915.1	44.1	22.8%
Fans - Exhaust	Electricity									0.0	0.0	0.0%
Refrigeration	Electricity									0.0	0.0	0.0%
HP Supplement	Electricity									0.0	0.0	0.0%
DHW	Elec	29.3	3.4	29.3	3.4	29.3	3.4	29.3	3.4	29.3	3.4	0.7%
DHW	Gas									0.0	0.0	0.0%
Total w/o Misc Equipment		2973.5		3027.2		2967.8		3027.5		2999.0		
Total w/ Misc Equipment		3993.6		4047.3		3987.9		4047.6		4019.1		

Energy Cost Summary

Energy Source	*Baseline Cost*	*Baseline Cost +90*	*Baseline Cost +180*	*Baseline Cost +270*	**Baseline Average**
Electricity*	$41,319	$42,459	$41,364	$42,451	**$41,898**
Gas	$7,366	$7,231	$7,295	$7,235	**$7,282**
Steam/ HW					**$0**
Chilled Water					**$0**
Total	**$48,685**	**$49,690**	**$48,659**	**$49,686**	**$49,180**

*Electricity cost excludes Misc Equipment electrical consumption cost (based upon virtual rate)
DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms


30% Alternative Energy End-uses
Conditioned Lighting
Unconditioned Lighting
Space Heating
Space Cooling
Pumps & Aux
Fans - Ventilation
DHW
Alt Energy Savings
Conditioned Lighting 19.3%
Unconditioned Lighting 5.9%
Space Heating 23.1%
Space Cooling 16.3%
Pumps & Aux 0.1%
Fans - Ventilation 3.6%
DHW 1.0%
Alt Energy Savings 30.8%
LARGE OFFICE WITH 38% WWR (OMAHA, NE)

Large Office 38% Glass Energy Results Summary
Omaha, NE

Description: 3.51: 3.50 + 3.00 + 1.20
Packaged VAV w/ VSD, electric terminal reheat; CEE Tier 1 cooling efficiencies; Solarban 70XL fenestration w/ thermally broken frame

Building Energy Performance Summary

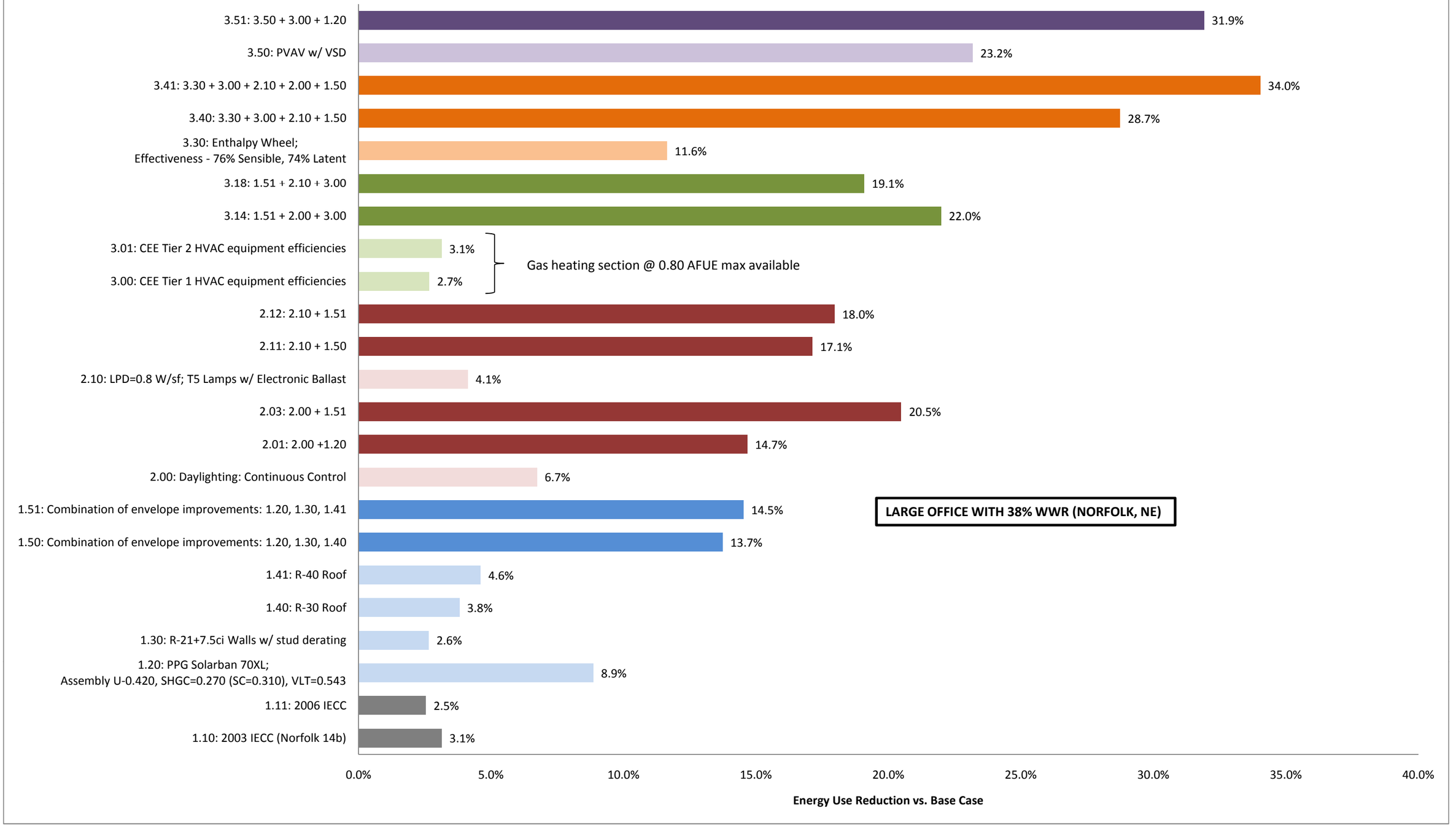
End Use	*Energy Source*	*Alternative Building*		*Average Baseline*		*Energy Difference Alt-Baseline*	*% of End Use of As Designed*	*Baseline Consumption Average*
		Energy [MMBtu]	*Peak [kW or therm/hr]*	*Energy [MMBtu]*	*Peak [kW or therm/hr]*	*[%]*	*[%]*	*[%]*
Conditioned Lighting	Electricity	579.6	54.0	579.6	54.0	0.0%	18.7%	14.4%
Unconditioned Lighting	Electricity	176.6	12.0	176.6	12.0	0.0%	5.7%	4.4%
Misc Equipment	Electricity	1020.1	95.0	1020.1	95.0	0.0%	32.9%	25.4%
Space Heating	Electricity	691.6	721.1	0.0	0.0		22.3%	0.0%
Space Heating	Gas			752.7	17.0	100.0%	0.0%	18.7%
Space Heating	Steam/ HW			0.0	0.0		0.0%	0.0%
Space Cooling	Elec	488.3	149.8	535.6	176.0	8.8%	15.8%	13.3%
Space Cooling	Chilled Water			0.0	0.0		0.0%	0.0%
Heat Rejection	Electricity			0.0	0.0		0.0%	0.0%
Pumps & Aux	Electricity	2.0	0.2	10.1	0.8	80.2%	0.1%	0.3%
Fans - Ventilation	Electricity	108.6	49.5	915.1	44.1	88.1%	3.5%	22.8%
Fans - Exhaust	Electricity			0.0	0.0		0.0%	0.0%
Refrigeration	Electricity			0.0	0.0		0.0%	0.0%
HP Supplement	Electricity			0.0	0.0		0.0%	0.0%
DHW	Elec	29.5	3.4	29.3	3.4	-0.7%	1.0%	0.7%
DHW	Gas			0.0	0.0		0.0%	0.0%
Total w/o Misc Equipment		**2076.2**		**2999.0**		**30.8%**	100.0%	100.0%
Alt Energy Savings		**922.8**						
Total w/ Misc Equipment		3096.3		4019.1		23.0%		

Energy Cost Summary

Energy Source	*As Designed Cost*	*Baseline Cost*
Electricity*	$43,027	$41,898
Gas	$200	$7,282
Steam/ HW		$0
Chilled Water		$0
Total	**$43,227**	**$49,180**

*Electricity cost excludes Misc Equipment electrical consumption cost (based upon virtual rate)
DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms

Alternative Energy Savings vs. ASHRAE 90.1-2004 Base Case



Large Office 38% Glass Energy Results Summary
Norfolk, NE

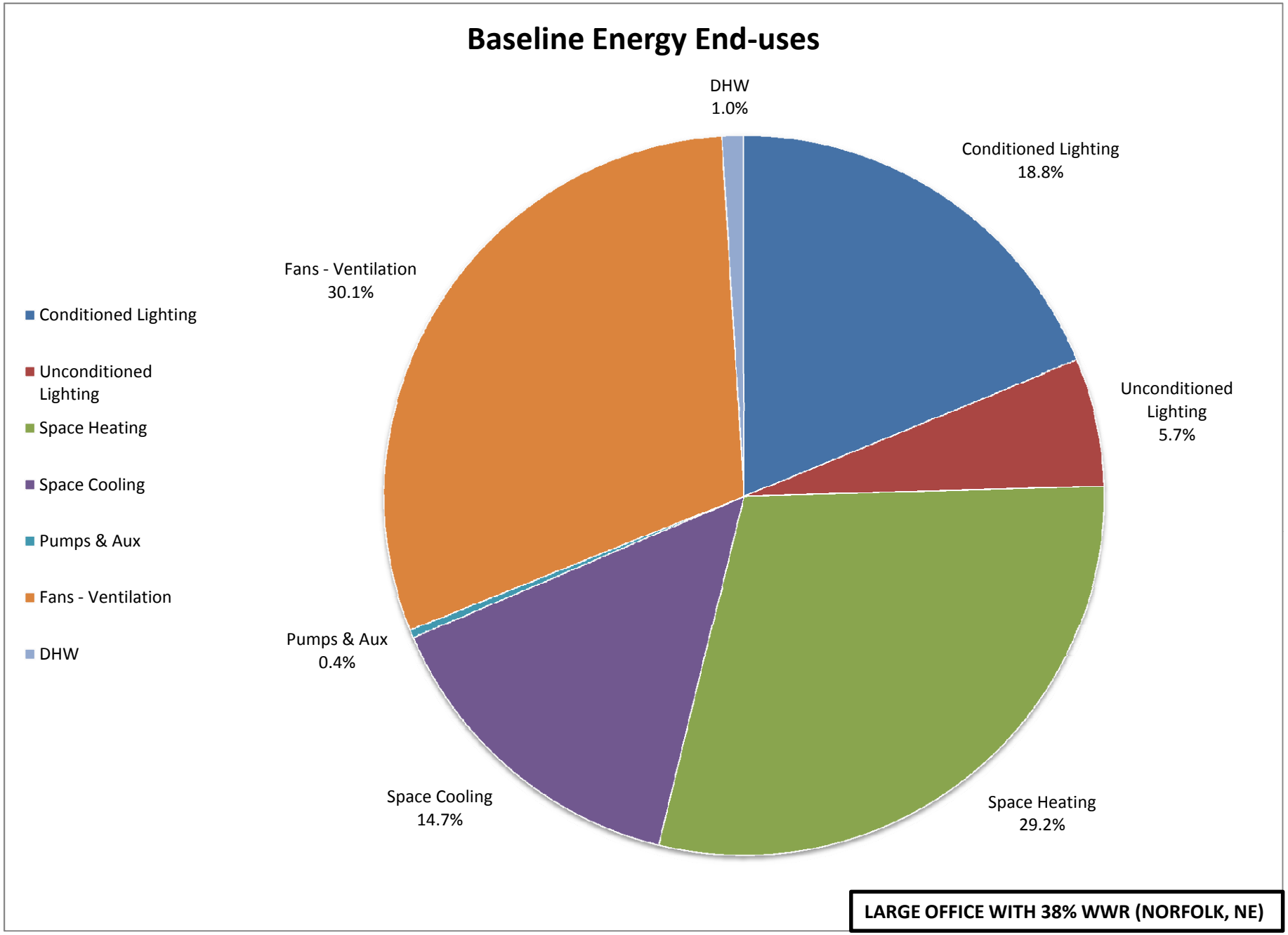
Run	Name	Annual Energy Use* [MMBtu]	Annual Energy Cost* [$]	Cost Savings vs. Avg. Base* [$]	Savings vs Avg. Base* [%]	Energy Use Reduction vs. Base* [MMBtu]	Energy Use Reduction vs. Base* [%]	Notes
0.00	Base Case	3053.8	$49,635					
	Base +90°	3108	$50,867					ASHRAE 90.1-2004 Baseline
	Base +180°	3047.1	$49,595					Appendix G
	Base +270°	3107.8	$50,861					Walls: U-0.084; Roof: U-0.063; Floors - U-0.052
	Avg Base Case	3079.2	$50,240					Windows: U-0.57, SHGC-0.39
1.10	2003 IECC	2982.5	$44,900	$5,339	10.6%	96.67	3.1%	1.10: 2003 IECC (Norfolk 14b)
1.11	2006 IECC	3001	$49,302	$938	1.9%	78.17	2.5%	1.11: 2006 IECC
1.20	Improved Fenestration	2806.3	$52,583	-$2,343	-4.7%	272.88	8.9%	1.20: PPG Solarban 70XL;
1.30	Improved Wall	2997.7	$49,112	$1,128	2.2%	81.47	2.6%	1.30: R-21+7.5ci Walls w/ stud
1.40	Improved Roof	2961.9	$48,767	$1,473	2.9%	117.27	3.8%	1.40: R-30 Roof
1.41	Improved Roof	2937.5	$48,540	$1,700	3.4%	141.67	4.6%	1.41: R-40 Roof
1.50	Composite Envelope	2656.1	$44,257	$5,983	11.9%	423.07	13.7%	1.50: Combination of envelope improvements: 1.20, 1.30, 1.40
1.51	Composite Envelope	2632	$44,034	$6,206	12.4%	447.18	14.5%	1.51: Combination of envelope improvements: 1.20, 1.30, 1.41
2.00	Daylighting Controls	2871.8	$44,998	$5,241	10.4%	207.37	6.7%	2.00: Daylighting: Continuous
2.01	Daylighting Controls	2627.5	$41,054	$9,185	18.3%	451.68	14.7%	2.01: 2.00 +1.20
2.02	Daylight w/ Comp. Envelope	2448.6	$39,415	$10,825	21.5%	630.57	20.5%	2.03: 2.00 + 1.51
2.10	Reduced LPD	2952.3	$47,180	$3,059	6.1%	126.88	4.1%	2.10: LPD=0.8 W/sf; T5 Lamps w/ Electronic Ballast
2.11	Reduced LPD	2551.8	$41,798	$8,442	16.8%	527.38	17.1%	2.11: 2.10 + 1.50
2.12	Reduced LPD	2525.9	$41,559	$8,681	17.3%	553.27	18.0%	2.12: 2.10 + 1.51
3.00	CEE Tier 1	2996.9	$48,393	$1,847	3.7%	82.27	2.7%	3.00: CEE Tier 1 HVAC
3.01	CEE Tier 2	2982.8	$48,069	$2,171	4.3%	96.37	3.1%	3.01: CEE Tier 2 HVAC
3.14	CEE Tier 1	2402.3	$38,412	$11,828	23.5%	676.88	22.0%	3.14: 1.51 + 2.00 + 3.00
3.18	CEE Tier 1	2491.6	$40,476	$9,764	19.4%	587.57	19.1%	3.18: 1.51 + 2.10 + 3.00

*Reported excluding Misc Equipment electrical end-use

Large Office 38% Glass Energy Results Summary
Norfolk, NE

Run	Name	Annual Energy Use* [MMBtu]	Annual Energy Cost* [$]	Cost Savings vs. Avg. Base* [$]	Savings vs Avg. Base* [%]	Energy Use Reduction vs. Base* [MMBtu]	Energy Use Reduction vs. Base* [%]	Notes
0.00	Base Case	3053.8	$49,635					
	Base +90°	3108	$50,867					ASHRAE 90.1-2004 Baseline Appendix G
	Base +180°	3047.1	$49,595					Walls: U-0.084; Roof: U-0.063; Floors - U-0.052
	Base +270°	3107.8	$50,861					Windows: U-0.57, SHGC-0.39
	Avg Base Case	3079.2	$50,240					
3.30	Enthalpy Wheel	2720.7	$47,022	$3,218	6.4%	358.47	11.6%	3.30: Enthalpy Wheel; Effectiveness - 76% Sensible, 74% Latent
3.40	Enthalpy Wheel	2194.1	$38,344	$11,896	23.7%	885.07	28.7%	3.40: 3.30 + 3.00 + 2.10 + 1.50
3.41	Enthalpy Wheel	2031.2	$37,331	$12,908	25.7%	1047.98	34.0%	3.41: 3.30 + 3.00 + 2.10 + 2.00 + 1.50
3.50	VAV w/VSD	2365.6	$48,407	$1,832	3.6%	713.57	23.2%	3.50: PVAV w/ VSD
3.51	VAV w/VSD	2096.6	$43,222	$7,018	14.0%	982.57	31.9%	3.51: 3.50 + 3.00 + 1.20

*Reported excluding Misc Equipment electrical end-use


Baseline Energy End-uses
DHW
1.0%
Conditioned Lighting
18.8%
Unconditioned
Lighting
5.7%
Space Heating
29.2%
Space Cooling
14.7%
Pumps & Aux
0.4%
Fans - Ventilation
30.1%
Conditioned Lighting
Unconditioned
Lighting
Space Heating
Space Cooling
Pumps & Aux
Fans - Ventilation
DHW
LARGE OFFICE WITH 38% WWR (NORFOLK, NE)

Large Office 38% Glass Energy Results Summary
Norfolk, NE

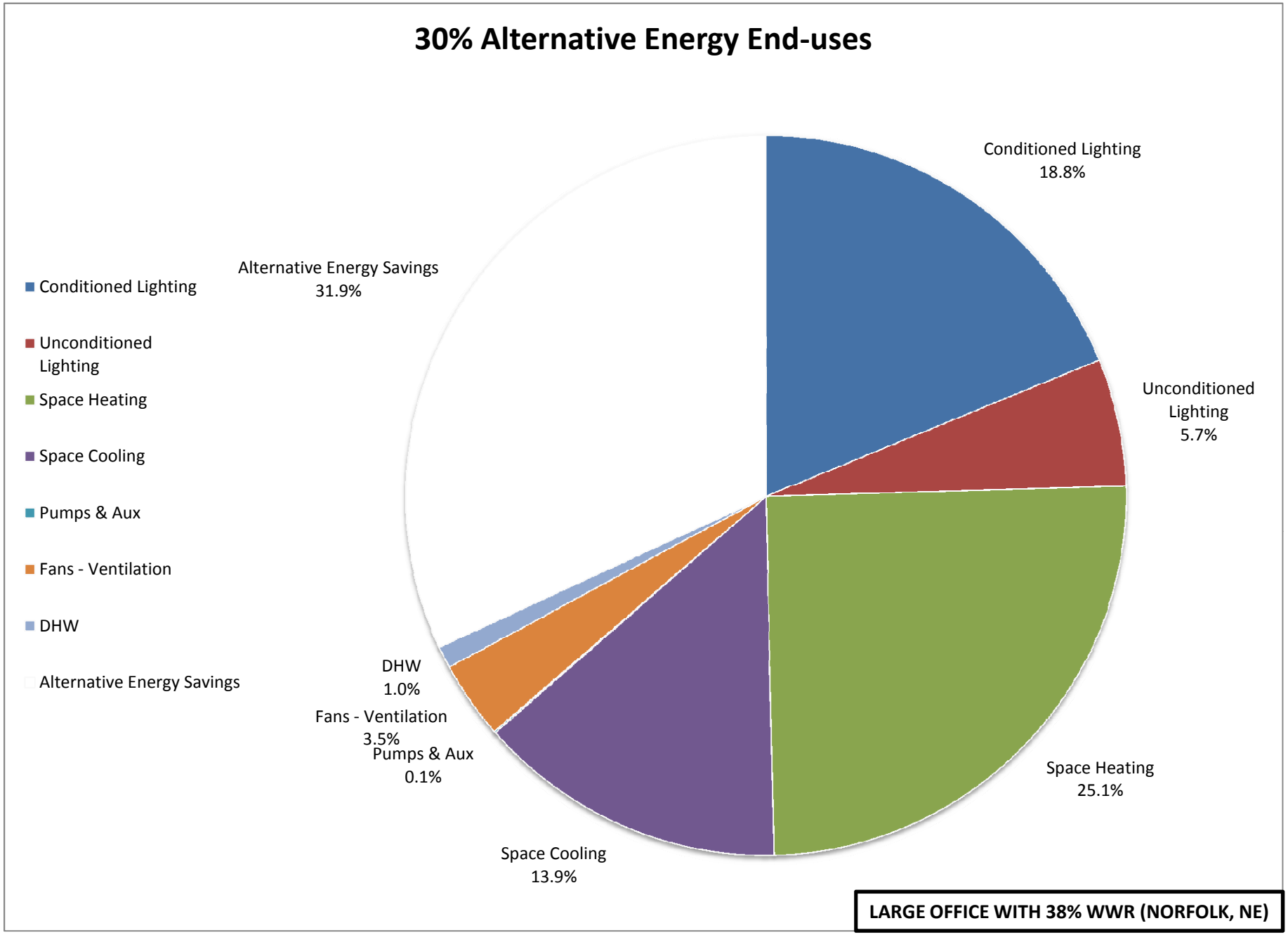
Building Energy Performance Summary - Base Case

End Use	*Energy Source*	*Baseline Building*		*Baseline Building +90*		*Baseline Building +180*		*Baseline Building +270*		*Baseline Average*		*% End Use of Baseline*
		Energy [MMbtu]	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	
Conditioned Lighting	Electricity	579.6	54.0	579.6	54.0	579.6	54.0	579.6	54.0	579.6	54.0	14.1%
Unconditioned Lighting	Electricity	176.6	12.0	176.6	12.0	176.6	12.0	176.6	12.0	176.6	12.0	4.3%
Misc Equipment	Electricity	1020.1	95.0	1020.1	95.0	1020.1	95.0	1020.1	95.0	1020.1	95.0	24.9%
Space Heating	Electricity									0.0	0.0	0.0%
Space Heating	Gas	910.1	19.0	894.6	20.0	901.8	19.0	894.8	20.0	900.3	19.5	22.0%
Space Heating	Steam/ HW									0.0	0.0	0.0%
Space Cooling	Electricity	445.9	156.3	462.9	157.2	444.7	155.9	462.8	157.0	454.1	156.6	11.1%
Space Cooling	CHW									0.0	0.0	0.0%
Heat Rejection	Electricity									0.0	0.0	0.0%
Pumps & Aux	Electricity	11.2	0.8	11.2	0.8	11.2	0.8	11.2	0.8	11.2	0.8	0.3%
Fans - Ventilation	Electricity	900.3	43.0	953.0	45.2	903.1	43.1	952.7	45.1	927.3	44.1	22.6%
Fans - Exhaust	Electricity									0.0	0.0	0.0%
Refrigeration	Electricity									0.0	0.0	0.0%
HP Supplement	Electricity									0.0	0.0	0.0%
DHW	Elec	30.1	3.6	30.1	3.6	30.1	3.6	30.1	3.6	30.1	3.6	0.7%
DHW	Gas									0.0	0.0	0.0%
Total less Misc Equipment		3053.8		3108.0		3047.1		3107.8		3079.2		
Total w/ Misc Equipment		4073.9		4128.1		4067.2		4127.9		4099.3		

Energy Cost Summary

Energy Source	*Baseline Cost*	*Baseline Cost +90*	*Baseline Cost +180*	*Baseline Cost +270*	**Baseline Average**
Electricity*	$41,916	$43,277	$41,945	$43,269	**$42,602**
Gas	$7,719	$7,590	$7,650	$7,592	**$7,638**
Steam/ HW					**$0**
Chilled Water					**$0**
Total	**$49,635**	**$50,867**	**$49,595**	**$50,861**	**$50,240**

*Electricity cost excludes Misc Equipment electrical consumption cost (based upon virtual rate)
DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms


30% Alternative Energy End-uses
Conditioned Lighting
Unconditioned Lighting
Space Heating
Space Cooling
Pumps & Aux
Fans - Ventilation
DHW
Alternative Energy Savings
Alternative Energy Savings
31.9%
Conditioned Lighting
18.8%
Unconditioned
Lighting
5.7%
Space Heating
25.1%
Space Cooling
13.9%
Pumps & Aux
0.1%
Fans - Ventilation
3.5%
DHW
1.0%
LARGE OFFICE WITH 38% WWR (NORFOLK, NE)

Large Office 38% Glass Energy Results Summary
Norfolk, NE

Description: 3.51: 3.50 + 3.00 + 1.20
Packaged VAV w/ VSD, electric terminal reheat; CEE Tier 1 cooling efficiencies; Solarban 70XL fenestration w/ thermally broken frame

Building Energy Performance Summary

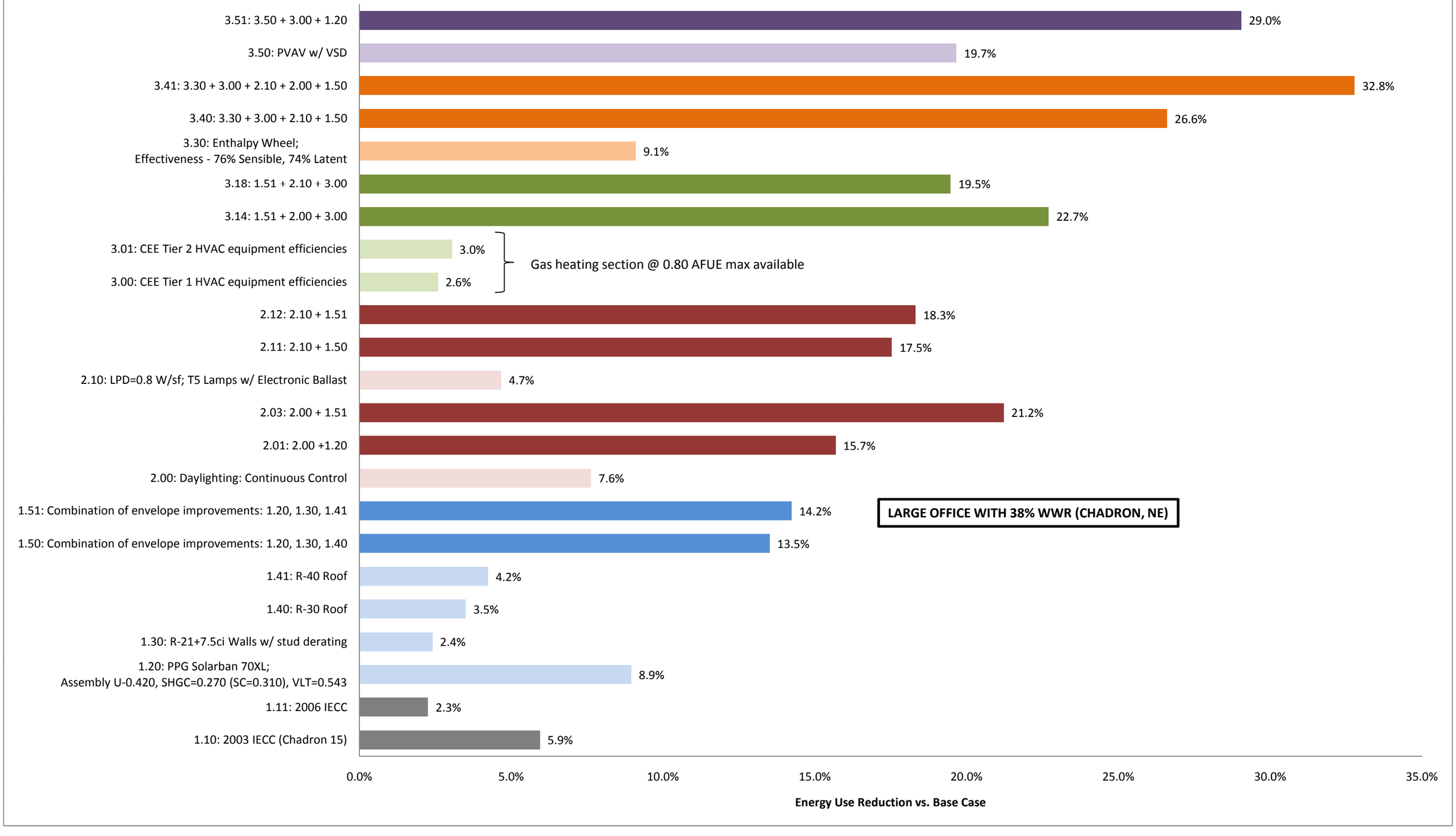
End Use	*Energy Source*	*Alternative Building*		*Average Baseline*		*Energy Difference Alt-Baseline*	*% of End Use of As Designed*	*Baseline Consumption Average*
		Energy [MMBtu]	*Peak [kW or therm/hr]*	*Energy [MMBtu]*	*Peak [kW or therm/hr]*	*[%]*	*[%]*	*[%]*
Conditioned Lighting	Electricity	579.6	54.0	579.6	54.0	0.0%	18.6%	14.1%
Unconditioned Lighting	Electricity	176.6	12.0	176.6	12.0	0.0%	5.7%	4.3%
Misc Equipment	Electricity	1020.1	95.0	1020.1	95.0	0.0%	32.7%	24.9%
Space Heating	Electricity	772.1	647.3	0.0	0.0		24.8%	0.0%
Space Heating	Gas			900.3	19.5	100.0%	0.0%	22.0%
Space Heating	Steam/ HW			0.0	0.0		0.0%	0.0%
Space Cooling	Elec	428.2	128.7	454.1	156.6	5.7%	13.7%	11.1%
Space Cooling	Chilled Water			0.0	0.0		0.0%	0.0%
Heat Rejection	Electricity			0.0	0.0		0.0%	0.0%
Pumps & Aux	Electricity	2.2	0.2	11.2	0.8	80.4%	0.1%	0.3%
Fans - Ventilation	Electricity	107.6	49.3	927.3	44.1	88.4%	3.5%	22.6%
Fans - Exhaust	Electricity			0.0	0.0		0.0%	0.0%
Refrigeration	Electricity			0.0	0.0		0.0%	0.0%
HP Supplement	Electricity			0.0	0.0		0.0%	0.0%
DHW	Elec	30.3	3.6	30.1	3.6	-0.7%	1.0%	0.7%
DHW	Gas			0.0	0.0		0.0%	0.0%
Total w/o Misc Equipment		**2096.6**		**3079.2**		**31.9%**	100.0%	100.0%
Alternative Energy Savings		**982.6**						
Total w/ Misc Equipment		3116.7		4099.3		24.0%		

Energy Cost Summary

Energy Source	*As Designed Cost*	*Baseline Cost*
Electricity*	$43,022	$42,602
Gas	$200	$7,638
Steam/ HW		$0
Chilled Water		$0
Total	**$43,222**	**$50,240**

*Electricity cost excludes Misc Equipment electrical consumption cost (based upon virtual rate)
DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms

Alternative Energy Savings vs. ASHRAE 90.1-2004 Base Case



Large Office 38% Glass Energy Results Summary
Chadron, NE

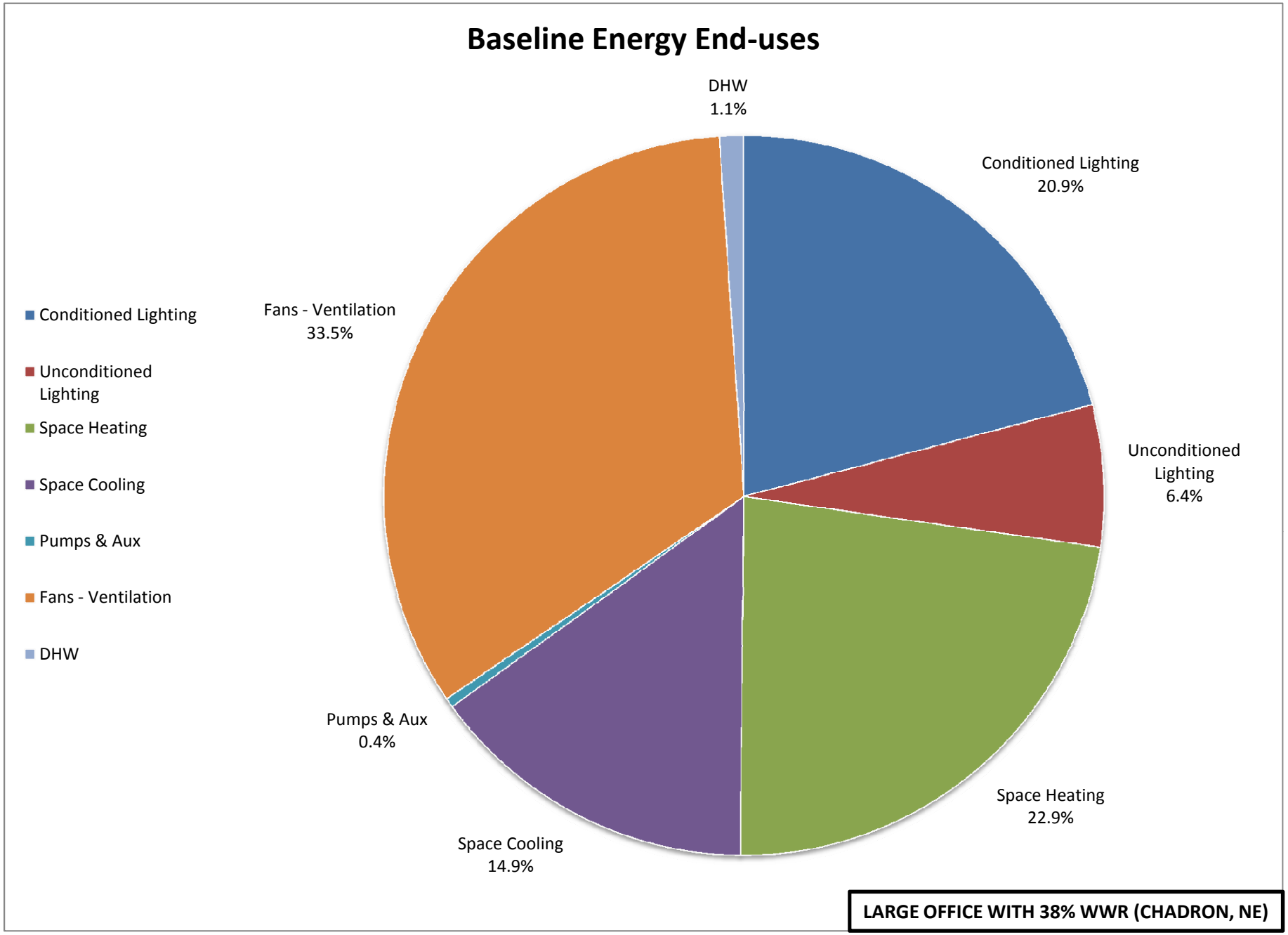
Run	Name	Annual Energy Use* [MMBtu]	Annual Energy Cost* [$]	Cost Savings vs. Avg. Base* [$]	Savings vs Avg. Base* [%]	Energy Use Reduction vs. Base* [MMBtu]	Energy Use Reduction vs. Base* [%]	Notes
0.00	Base Case	2752.9	$46,621					
	Base +90°	2796.8	$47,868					ASHRAE 90.1-2004 Baseline
	Base +180°	2745.1	$46,568					Appendix G
	Base +270°	2797	$47,874					Walls: U-0.084; Roof: U-0.063; Floors - U-0.052
	Avg Base Case	2772.95	$47,233					Windows: U-0.57, SHGC-0.39
1.10	2003 IECC	2608.3	$46,954	$279	0.6%	164.65	5.9%	1.10: 2003 IECC (Chadron 15)
1.11	2006 IECC	2710.4	$46,426	$807	1.7%	62.55	2.3%	1.11: 2006 IECC
1.20	Improved Fenestration	2524.9	$42,774	$4,459	9.4%	248.05	8.9%	1.20: PPG Solarban 70XL;
1.30	Improved Wall	2706.4	$46,171	$1,062	2.2%	66.55	2.4%	1.30: R-21+7.5ci Walls w/ stud
1.40	Improved Roof	2676.1	$45,883	$1,350	2.9%	96.85	3.5%	1.40: R-30 Roof
1.41	Improved Roof	2655.6	$45,683	$1,550	3.3%	117.35	4.2%	1.41: R-40 Roof
1.50	Composite Envelope	2398.4	$41,527	$5,706	12.1%	374.55	13.5%	1.50: Combination of envelope improvements: 1.20, 1.30, 1.40
1.51	Composite Envelope	2378.3	$41,332	$5,901	12.5%	394.65	14.2%	1.51: Combination of envelope improvements: 1.20, 1.30, 1.41
2.00	Daylighting Controls	2561.6	$41,950	$5,283	11.2%	211.35	7.6%	2.00: Daylighting: Continuous
2.01	Daylighting Controls	2338	$38,172	$9,061	19.2%	434.95	15.7%	2.01: 2.00 +1.20
2.02	Daylight w/ Comp. Envelope	2184.6	$36,672	$10,561	22.4%	588.35	21.2%	2.03: 2.00 + 1.51
2.10	Reduced LPD	2643.7	$44,143	$3,090	6.5%	129.25	4.7%	2.10: LPD=0.8 W/sf; T5 Lamps w/ Electronic Ballast
2.11	Reduced LPD	2286.7	$39,024	$8,209	17.4%	486.25	17.5%	2.11: 2.10 + 1.50
2.12	Reduced LPD	2265.1	$38,813	$8,420	17.8%	507.85	18.3%	2.12: 2.10 + 1.51
3.00	CEE Tier 1	2701.4	$45,502	$1,731	3.7%	71.55	2.6%	3.00: CEE Tier 1 HVAC equipment
3.01	CEE Tier 2	2688.6	$45,239	$1,994	4.2%	84.35	3.0%	3.01: CEE Tier 2 HVAC equipment
3.14	CEE Tier 1	2143.6	$35,790	$11,443	24.2%	629.35	22.7%	3.14: 1.51 + 2.00 + 3.00
3.18	CEE Tier 1	2233	$37,851	$9,382	19.9%	539.95	19.5%	3.18: 1.51 + 2.10 + 3.00

*Reported excluding Misc equipment electrical end-use

Large Office 38% Glass Energy Results Summary
Chadron, NE

Run	Name	Annual Energy Use* [MMBtu]	Annual Energy Cost* [$]	Cost Savings vs. Avg. Base* [$]	Savings vs Avg. Base* [%]	Energy Use Reduction vs. Base* [MMBtu]	Energy Use Reduction vs. Base* [%]	Notes
0.00	Base Case	2752.9	$46,621					
	Base +90°	2796.8	$47,868					ASHRAE 90.1-2004 Baseline
	Base +180°	2745.1	$46,568					Appendix G
	Base +270°	2797	$47,874					Walls: U-0.084; Roof: U-0.063; Floors - U-0.052
	Avg Base Case	2772.95	$47,233					Windows: U-0.57, SHGC-0.39
3.30	Enthalpy Wheel	2520.7	$44,924	$2,309	4.9%	252.25	9.1%	3.30: Enthalpy Wheel; Effectiveness - 76% Sensible, 74% Latent
3.40	Enthalpy Wheel	2035.4	$36,608	$10,625	22.5%	737.55	26.6%	3.40: 3.30 + 3.00 + 2.10 + 1.50
3.41	Enthalpy Wheel	1864	$32,805	$14,428	30.5%	908.95	32.8%	3.41: 3.30 + 3.00 + 2.10 + 2.00 + 1.50
3.50	VAV w/VSD	2227.8	$41,993	$5,239	11.1%	545.15	19.7%	3.50: PVAV w/ VSD
3.50	VAV w/VSD	1967.5	$35,423	$11,810	25.0%	805.45	29.0%	3.51: 3.50 + 3.00 + 1.20

*Reported excluding Misc equipment electrical end-use


Baseline Energy End-uses
DHW
1.1%
Conditioned Lighting
20.9%
Unconditioned
Lighting
6.4%
Space Heating
22.9%
Space Cooling
14.9%
Pumps & Aux
0.4%
Fans - Ventilation
33.5%
Conditioned Lighting
Unconditioned
Lighting
Space Heating
Space Cooling
Pumps & Aux
Fans - Ventilation
DHW
LARGE OFFICE WITH 38% WWR (CHADRON, NE)

Large Office 38% Glass Energy Results Summary
Chadron, NE

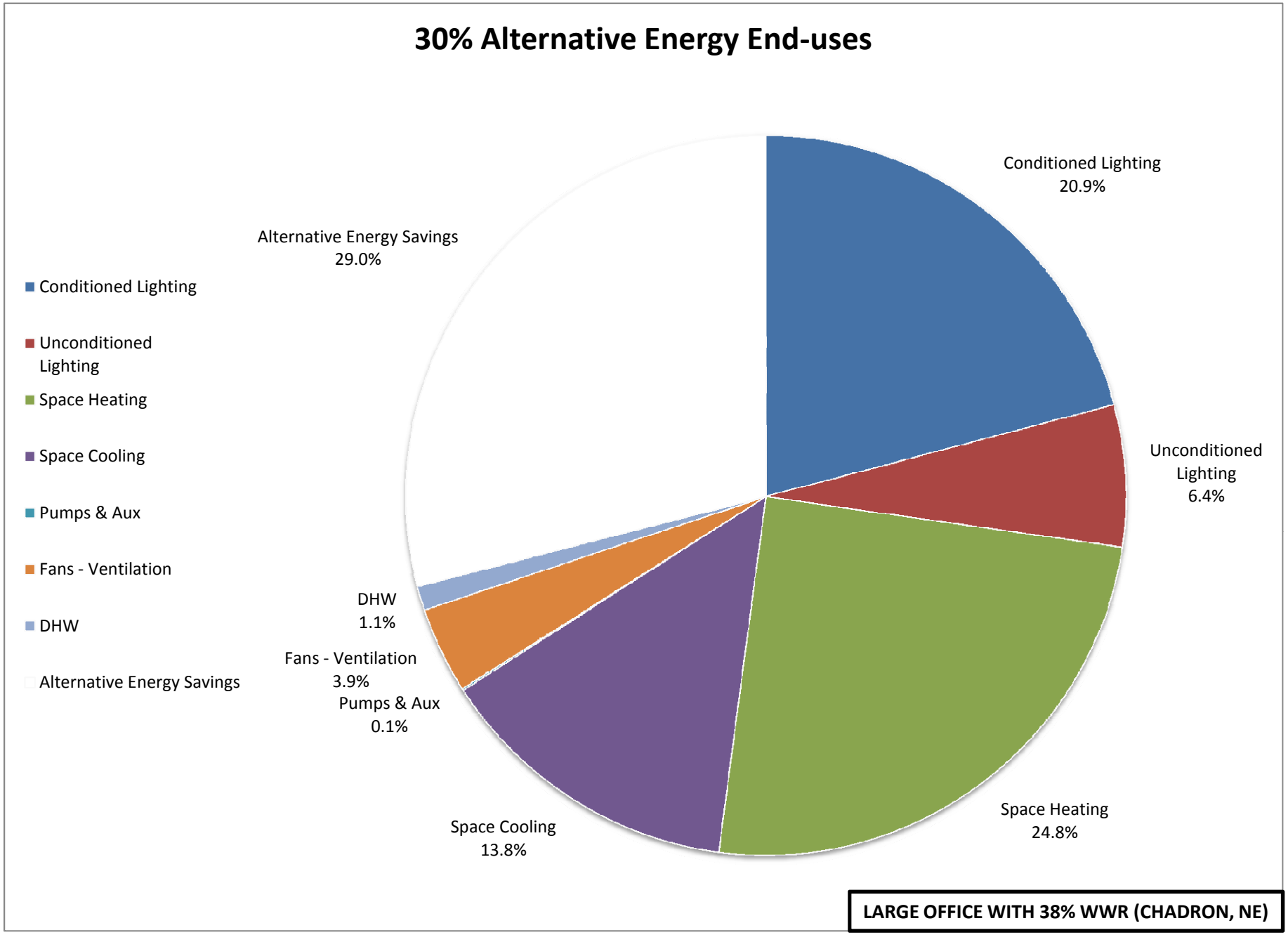
Building Energy Performance Summary - Base Case

End Use	*Energy Source*	*Baseline Building*		*Baseline Building +90*		*Baseline Building +180*		*Baseline Building +270*		*Baseline Average*		*% End Use of Baseline*
		Energy [MMbtu]	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	
Conditioned Lighting	Electricity	579.6	54.0	579.6	54.0	579.6	54.0	579.6	54.0	579.6	54.0	15.3%
Unconditioned Lighting	Electricity	176.6	12.0	176.6	12.0	176.6	12.0	176.6	12.0	176.6	12.0	4.7%
Misc Equipment	Electricity	1020.1	95.0	1020.1	95.0	1020.1	95.0	1020.1	95.0	1020.1	95.0	26.9%
Space Heating	Electricity									0.0	0.0	0.0%
Space Heating	Gas	652.5	17.0	621.3	17.0	642.8	17.0	621.3	17.0	634.5	17.0	16.7%
Space Heating	Steam/ HW									0.0	0.0	0.0%
Space Cooling	Electricity	402.0	142.1	422.9	148.9	400.6	141.9	422.8	148.7	412.1	145.4	10.9%
Space Cooling	CHW									0.0	0.0	0.0%
Heat Rejection	Electricity									0.0	0.0	0.0%
Pumps & Aux	Electricity	11.8	0.8	11.8	0.8	11.8	0.8	11.8	0.8	11.8	0.8	0.3%
Fans - Ventilation	Electricity	900.3	43.6	954.5	46.0	903.6	43.8	954.8	46.0	928.3	44.9	24.5%
Fans - Exhaust	Electricity									0.0	0.0	0.0%
Refrigeration	Electricity									0.0	0.0	0.0%
HP Supplement	Electricity									0.0	0.0	0.0%
DHW	Elec	30.1	3.4	30.1	3.4	30.1	3.4	30.1	3.4	30.1	3.4	0.8%
DHW	Gas									0.0	0.0	0.0%
Total w/o Misc Equipment		2752.9		2796.8		2745.1		2797.0		2773.0		
Total w/ Misc Equipment		3773.0		3816.9		3765.2		3817.1		3793.1		

Energy Cost Summary

Energy Source	*Baseline Cost*	*Baseline Cost +90*	*Baseline Cost +180*	*Baseline Cost +270*	**Baseline Average**
Electricity*	$40,970	$42,488	$41,002	$42,493	**$41,738**
Gas	$5,651	$5,380	$5,566	$5,381	**$5,495**
Steam/ HW					**$0**
Chilled Water					**$0**
Total	**$46,621**	**$47,868**	**$46,568**	**$47,874**	**$47,233**

*Electricity cost excludes Misc Equipment electrical consumption cost (based upon virtual rate)
DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms


30% Alternative Energy End-uses
Conditioned Lighting
Unconditioned Lighting
Space Heating
Space Cooling
Pumps & Aux
Fans - Ventilation
DHW
Alternative Energy Savings
Conditioned Lighting 20.9%
Unconditioned Lighting 6.4%
Space Heating 24.8%
Space Cooling 13.8%
Pumps & Aux 0.1%
Fans - Ventilation 3.9%
DHW 1.1%
Alternative Energy Savings 29.0%
LARGE OFFICE WITH 38% WWR (CHADRON, NE)

Large Office 38% Glass Energy Results Summary
Chadron, NE

Description: 3.51: 3.50 + 3.00 + 1.20
Packaged VAV w/ VSD, electric terminal reheat; CEE Tier 1 cooling efficiencies; Solarban 70XL fenestration w/ thermally broken frame

Building Energy Performance Summary

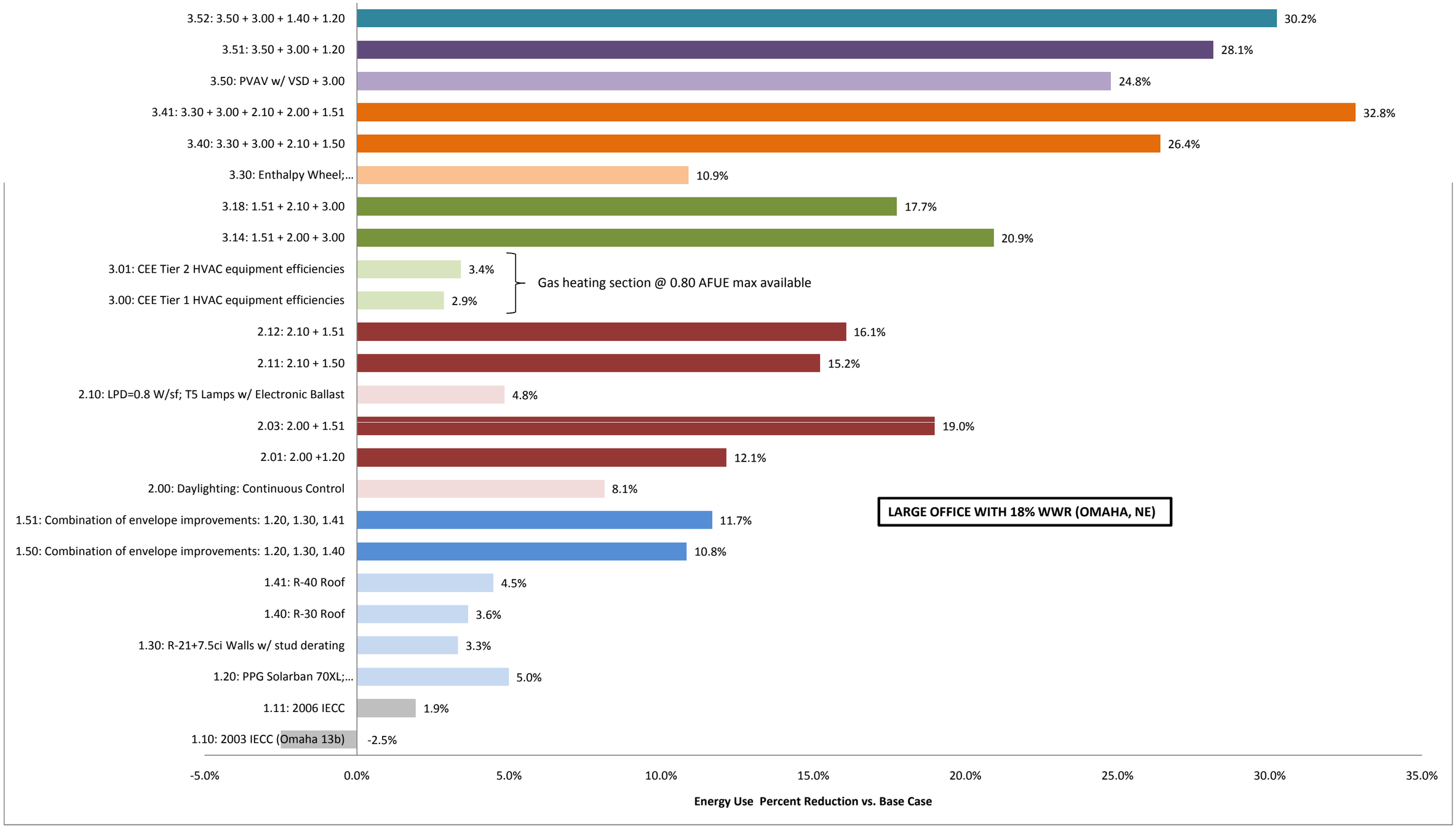
End Use	*Energy Source*	*Alternative Building*		*Average Baseline*		*Energy Difference Alt-Baseline*	*% of End Use of As Designed*	*Baseline Consumption Average*
		Energy [MMBtu]	*Peak [kW or therm/hr]*	*Energy [MMBtu]*	*Peak [kW or therm/hr]*	*[%]*	*[%]*	*[%]*
Conditioned Lighting	Electricity	579.6	54.0	579.6	54.0	0.0%	19.4%	15.3%
Unconditioned Lighting	Electricity	176.6	12.0	176.6	12.0	0.0%	5.9%	4.7%
Misc Equipment	Electricity	1020.1	95.0	1020.1	95.0	0.0%	34.1%	26.9%
Space Heating	Electricity	688.1	702.4	0.0	0.0		23.0%	0.0%
Space Heating	Gas			634.5	17.0	100.0%	0.0%	16.7%
Space Heating	Steam/ HW			0.0	0.0		0.0%	0.0%
Space Cooling	Elec	383.3	116.9	412.1	145.4	7.0%	12.8%	10.9%
Space Cooling	Chilled Water			0.0	0.0		0.0%	0.0%
Heat Rejection	Electricity			0.0	0.0		0.0%	0.0%
Pumps & Aux	Electricity	2.3	0.2	11.8	0.8	80.5%	0.1%	0.3%
Fans - Ventilation	Electricity	107.4	50.0	928.3	44.9	88.4%	3.6%	24.5%
Fans - Exhaust	Electricity			0.0	0.0		0.0%	0.0%
Refrigeration	Electricity			0.0	0.0		0.0%	0.0%
HP Supplement	Electricity			0.0	0.0		0.0%	0.0%
DHW	Elec	30.2	3.4	30.1	3.4	-0.3%	1.0%	0.8%
DHW	Gas			0.0	0.0		0.0%	0.0%
Total w/o Misc Equipment		**1967.5**		**2773.0**		**29.0%**	100.0%	100.0%
Alternative Energy Savings		**805.5**						
Total w/ Misc Equipment		2987.6		3793.1		21.2%		

Energy Cost Summary

Energy Source	*As Designed Cost*	*Baseline Cost*
Electricity*	$35,423	$41,738
Gas	$0	$5,495
Steam/ HW		$0
Chilled Water		$0
Total	**$35,423**	**$47,233**

*Electricity cost excludes Misc Equipment electrical consumption cost (based upon virtual rate)
DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms

Alternative Energy Savings vs. ASHRAE 90.1-2004 Base Case



Large Office 18% Glass Energy Results Summary
Omaha, NE

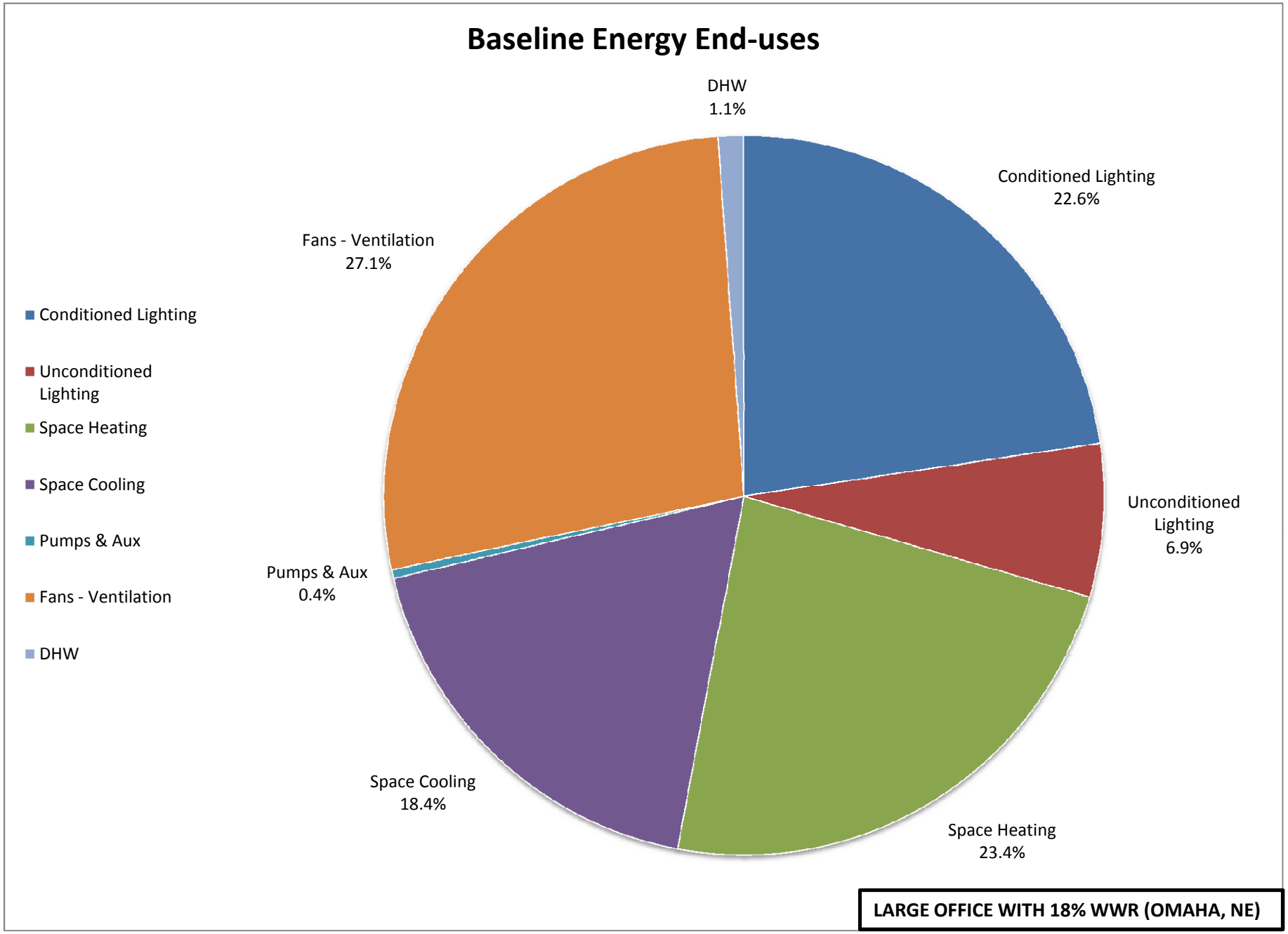
Run	Name	Annual Energy Use* [MMBtu]	Annual Energy Cost* [$]	Cost Savings vs. Avg. Base* [$]	Savings vs Avg. Base* [%]	Energy Use Reduction vs. Base* [MMBtu]	Energy Use Reduction vs. Base* [%]	Notes
0.00	Base Case	2545.0	$42,455					
	Base +90°	2577.1	$43,007					
	Base +180°	2540.2	$42,429					ASHRAE 90.1-2004 Baseline Appendix G
	Base +270°	2577.2	$43,006					Walls: U-0.084; Roof: U-0.063; Floors - U-0.052
	Avg Base Case	2559.9	$42,725					Windows: U-0.57, SHGC-0.39
1.10	2003 IECC	2623.7	$43,938	-$1,214	-2.8%	-63.8	-2.5%	1.10: 2003 IECC (Omaha 13b)
1.11	2006 IECC	2510.5	$42,199	$525	1.2%	49.4	1.9%	1.11: 2006 IECC
1.20	Improved Fenestration	2432.4	$40,707	$2,018	4.7%	127.5	5.0%	1.20: PPG Solarban 70XL;
1.30	Improved Wall	2475.0	$41,752	$972	2.3%	84.9	3.3%	1.30: R-21+7.5ci Walls w/ stud derating
1.40	Improved Roof	2466.5	$41,630	$1,094	2.6%	93.4	3.6%	1.40: R-30 Roof
1.41	Improved Roof	2445.1	$41,406	$1,318	3.1%	114.8	4.5%	1.41: R-40 Roof
1.50	Composite Envelope	2282.6	$39,142	$3,583	8.4%	277.3	10.8%	1.50: Combination of envelope improvements: 1.20, 1.30, 1.40
1.51	Composite Envelope	2261.2	$38,919	$3,806	8.9%	298.7	11.7%	1.51: Combination of envelope improvements: 1.20, 1.30, 1.41
2.00	Daylighting controls	2351.8	$38,115	$4,610	10.8%	208.1	8.1%	2.00: Daylighting: Continuous Control
2.01	Daylighting controls	2249.2	$36,580	$6,145	14.4%	310.7	12.1%	2.01: 2.00 +1.20
2.02	Daylighting controls	2073.9	$34,765	$7,960	18.6%	486.0	19.0%	2.03: 2.00 + 1.51
2.10	Reduced LPD	2435.8	$39,985	$2,739	6.4%	124.1	4.8%	2.10: LPD=0.8 W/sf; T5 Lamps w/ Electronic Ballast
2.11	Reduced LPD	2170.2	$36,639	$6,085	14.2%	389.7	15.2%	2.11: 2.10 + 1.50
2.12	Reduced LPD	2148.6	$36,414	$6,310	14.8%	411.3	16.1%	2.12: 2.10 + 1.51
3.00	CEE Tier 1	2486.7	$41,135	$1,590	3.7%	73.2	2.9%	3.00: CEE Tier 1 HVAC equipment
3.01	CEE Tier 2	2472.5	$40,814	$1,911	4.5%	87.4	3.4%	3.01: CEE Tier 2 HVAC equipment
3.14	CEE Tier 1	2024.3	$33,661	$9,063	21.2%	535.6	20.9%	3.14: 1.51 + 2.00 + 3.00
3.18	CEE Tier 1	2105.7	$35,193	$7,532	17.6%	454.2	17.7%	3.18: 1.51 + 2.10 + 3.00
3.30	Enthalpy Wheel	2280.9	$39,691	$3,034	7.1%	279.0	10.9%	3.30: Enthalpy Wheel; Effectiveness - 76% Sensible, 74% Latent
3.40	Enthalpy Wheel	1884.1	$43,077	-$353	-0.8%	675.8	26.4%	3.40: 3.30 + 3.00 + 2.10 + 1.50
3.41	Enthalpy Wheel	1719.8	$29,722	$13,002	30.4%	840.1	32.8%	3.41: 3.30 + 3.00 + 2.10 + 2.00 + 1.51

*Reported excluding Misc Equipment electrical end-use

Large Office 18% Glass Energy Results Summary
Omaha, NE

Run	Name	Annual Energy Use* [MMBtu]	Annual Energy Cost* [$]	Cost Savings vs. Avg. Base* [$]	Savings vs Avg. Base* [%]	Energy Use Reduction vs. Base* [MMBtu]	Energy Use Reduction vs. Base* [%]	Notes
0.00	Base Case	2545.0	$42,455					
	Base +90°	2577.1	$43,007					
	Base +180°	2540.2	$42,429					ASHRAE 90.1-2004 Baseline Appendix G
	Base +270°	2577.2	$43,006					Walls: U-0.084; Roof: U-0.063; Floors - U-0.052
	Avg Base Case	2559.9	$42,725					Windows: U-0.57, SHGC-0.39
3.50	VAV w/VSD	1925.6	$40,043	$2,681	6.3%	634.3	24.8%	3.50: PVAV w/ VSD + 3.00
3.51	VAV w/VSD	1839.5	$38,208	$4,516	10.6%	720.4	28.1%	3.51: 3.50 + 3.00 + 1.20
3.52	VAV w/VSD	1786.3	$37,034	$5,690	13.3%	773.6	30.2%	3.52: 3.50 + 3.00 + 1.40 + 1.20

*Reported excluding Misc Equipment electrical end-use


Baseline Energy End-uses
DHW
1.1%
Conditioned Lighting
22.6%
Fans - Ventilation
27.1%
Conditioned Lighting
Unconditioned Lighting
Space Heating
Space Cooling
Pumps & Aux
Fans - Ventilation
DHW
Unconditioned Lighting
6.9%
Pumps & Aux
0.4%
Space Cooling
18.4%
Space Heating
23.4%
LARGE OFFICE WITH 18% WWR (OMAHA, NE)

Large Office 18% Glass Energy Results Summary
Omaha, NE

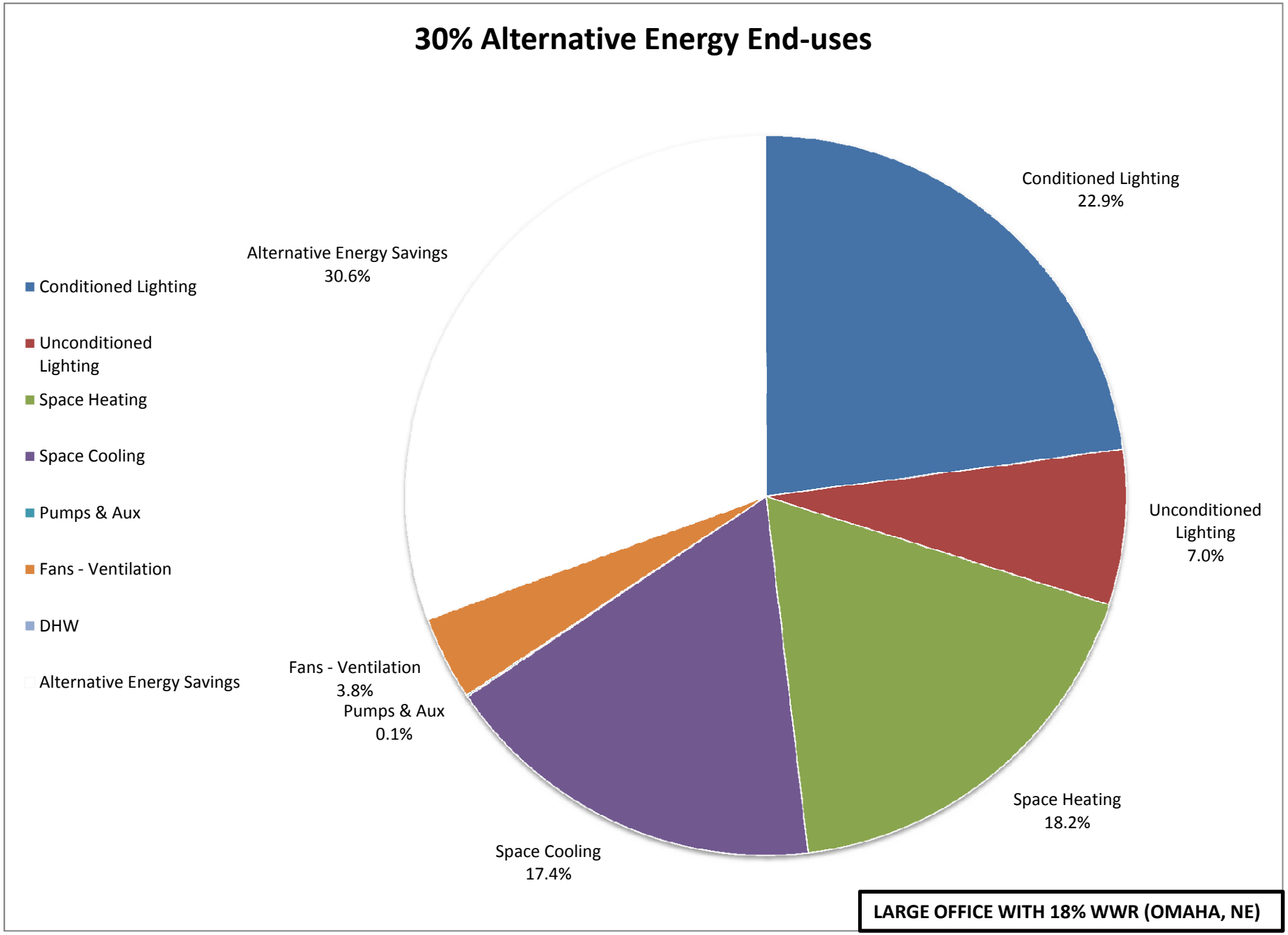
Building Energy Performance Summary - Base Case

End Use	*Energy Source*	*Baseline Building*		*Baseline Building +90*		*Baseline Building +180*		*Baseline Building +270*		*Baseline Average*		*% End Use of Baseline*
		Energy [MMbtu]	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	
Conditioned Lighting	Electricity	579.6	54.0	579.6	54.0	579.6	54.0	579.6	54.0	579.6	54.0	16.2%
Unconditioned Lighting	Electricity	176.6	12.0	176.6	12.0	176.6	12.0	176.6	12.0	176.6	12.0	4.9%
Misc Equipment	Electricity	1020.1	95.0	1020.1	95.0	1020.1	95.0	1020.1	95.0	1020.1	95.0	28.5%
Space Heating	Electricity									0.0	0.0	0.0%
Space Heating	Gas	600.9	16.0	599.6	16.0	595.9	16.0	599.6	16.0	599.0	16.0	16.7%
Space Heating	Steam/ HW									0.0	0.0	0.0%
Space Cooling	Electricity	464.8	157.2	476.1	159.2	464.2	157.0	476.2	159.2	470.3	158.2	13.1%
Space Cooling	CHW									0.0	0.0	0.0%
Heat Rejection	Electricity									0.0	0.0	0.0%
Pumps & Aux	Electricity	10.1	0.8	10.1	0.8	10.1	0.8	10.1	0.8	10.1	0.8	0.3%
Fans - Ventilation	Electricity	683.7	34.4	705.8	35.4	684.5	34.5	705.8	35.4	695.0	34.9	19.4%
Fans - Exhaust	Electricity									0.0	0.0	0.0%
Refrigeration	Electricity									0.0	0.0	0.0%
HP Supplement	Electricity									0.0	0.0	0.0%
DHW	Elec	29.3	3.4	29.3	3.4	29.3	3.4	29.3	3.4	29.3	3.4	0.8%
DHW	Gas									0.0	0.0	0.0%
Total w/o Misc Equipment		2545.0		2577.1		2540.2		2577.2		2559.9		
Total w/ Misc Equipment		3565.1		3597.2		3560.3		3597.3		3580.0		

Energy Cost Summary

Energy Source	*Baseline Cost*	*Baseline Cost +90*	*Baseline Cost +180*	*Baseline Cost +270*	**Baseline Average**
Electricity*	$36,596	$37,161	$36,618	$37,160	**$36,884**
Gas	$5,859	$5,846	$5,811	$5,846	**$5,841**
Steam/ HW					**$0**
Chilled Water					**$0**
Total	**$42,455**	**$43,007**	**$42,429**	**$43,006**	**$42,725**

*Electricity cost excludes Misc Equipment electrical consumption cost (based upon virtual rate)
DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms


30% Alternative Energy End-uses
Conditioned Lighting
Unconditioned Lighting
Space Heating
Space Cooling
Pumps & Aux
Fans - Ventilation
DHW
Alternative Energy Savings
Alternative Energy Savings
30.6%
Conditioned Lighting
22.9%
Unconditioned
Lighting
7.0%
Space Heating
18.2%
Space Cooling
17.4%
Pumps & Aux
0.1%
Fans - Ventilation
3.8%
LARGE OFFICE WITH 18% WWR (OMAHA, NE)

Large Office 18% Glass Energy Results Summary
Omaha, NE

Description: 3.52: 3.50 + 3.00 + 1.40 + 1.20
Packaged VAV w/ VSD, electric terminal reheat; CEE Tier 1 cooling efficiencies; R-30 roof; Solarban 70XL fenestration w/ thermally broken frame

Building Energy Performance Summary

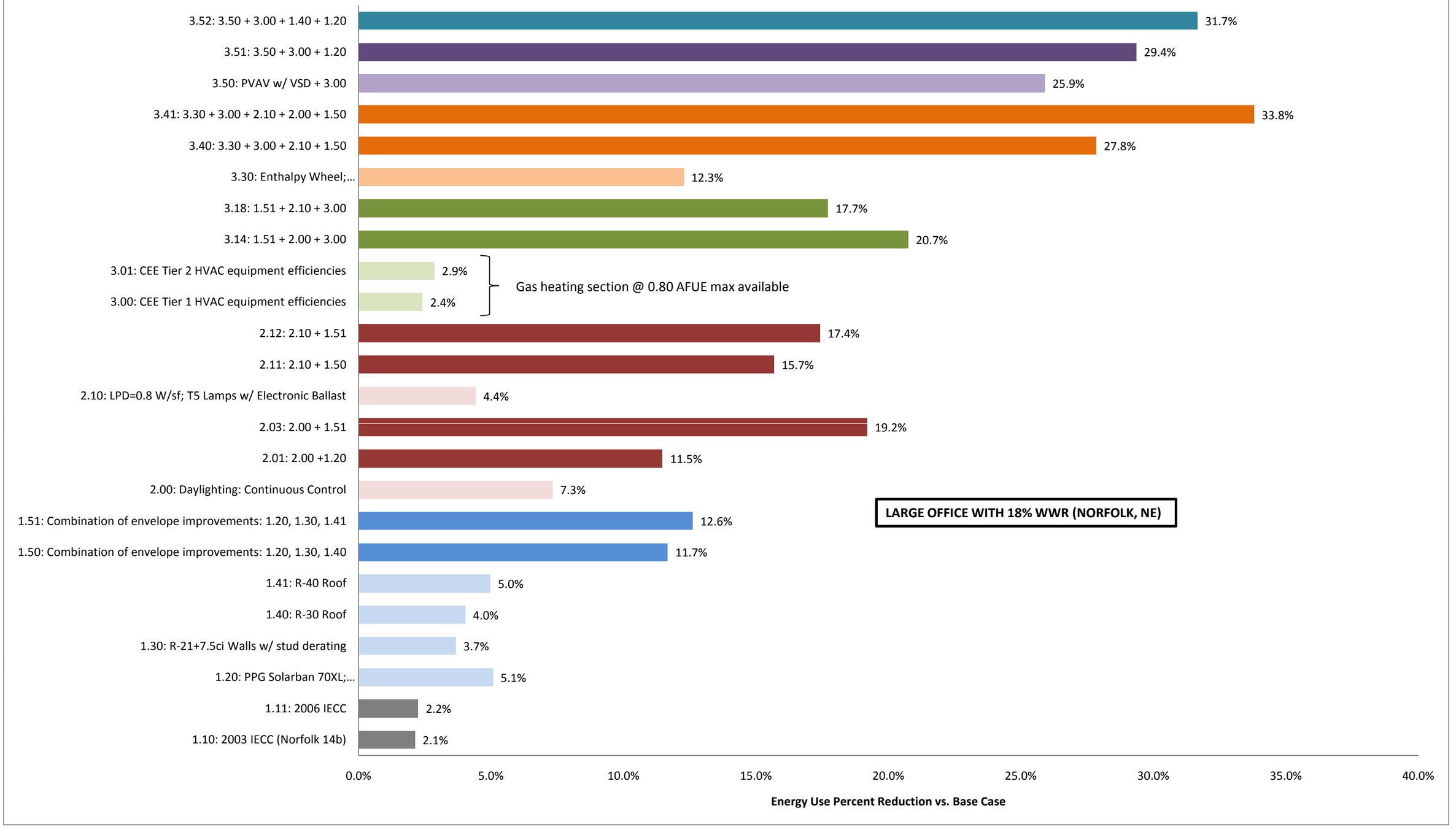
End Use	*Energy Source*	*Alternative Building*		*Average Baseline*		*Energy Difference Alt-Baseline*	*% of End Use of As Designed*	*Baseline Consumption Average*
		Energy [MMbtu]	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	*[%]*	*[%]*	*[%]*
Conditioned Lighting	Electricity	579.6	54	579.6	54.0	0.0%	20.7%	16.2%
Unconditioned Lighting	Electricity	176.6	12	176.6	12.0	0.0%	6.3%	4.9%
Misc Equipment	Electricity	1020.1	95	1020.1	95.0	0.0%	36.3%	28.5%
Space Heating	Electricity	461.4	605.3	0.0	0.0		16.4%	0.0%
Space Heating	Gas			599.0	16.0	100.0%	0.0%	16.7%
Space Heating	Steam/ HW			0.0	0.0		0.0%	0.0%
Space Cooling	Elec	441.1	136.3	470.3	158.2	6.2%	15.7%	13.1%
Space Cooling	Chilled Water			0.0	0.0		0.0%	0.0%
Heat Rejection	Electricity			0.0	0.0		0.0%	0.0%
Pumps & Aux	Electricity	2.0	0.2	10.1	0.8	80.2%	0.1%	0.3%
Fans - Ventilation	Electricity	96.1	41.5	695.0	34.9	86.2%	3.4%	19.4%
Fans - Exhaust	Electricity			0.0	0.0		0.0%	0.0%
Refrigeration	Electricity			0.0	0.0		0.0%	0.0%
HP Supplement	Electricity			0.0	0.0		0.0%	0.0%
DHW	Elec	29.5	3.4	29.3	3.4	-0.7%	1.1%	0.8%
DHW	Gas			0.0	0.0		0.0%	0.0%
Total w/o Misc Equipment		**1786.3**		**2559.9**		**30.2%**	100.0%	100.0%
Alternative Energy Savings		**773.6**						
Total w/ Misc Equipment		2806.4		3580.0		21.6%		

Energy Cost Summary

Energy Source	*As Designed Cost*	*Baseline Cost*
Electricity*	$36,834	$36,884
Gas	$200	$5,841
Steam/ HW		$0
Chilled Water		$0
Total	**$37,034**	$42,725

*Electricity cost excludes Misc Equipment electrical consumption cost (based upon virtual rate)
DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms

Alternative Energy Savings vs. ASHRAE 90.1-2004 Base Case



Large Office 18% Glass Energy Results Summary
Norfolk, NE

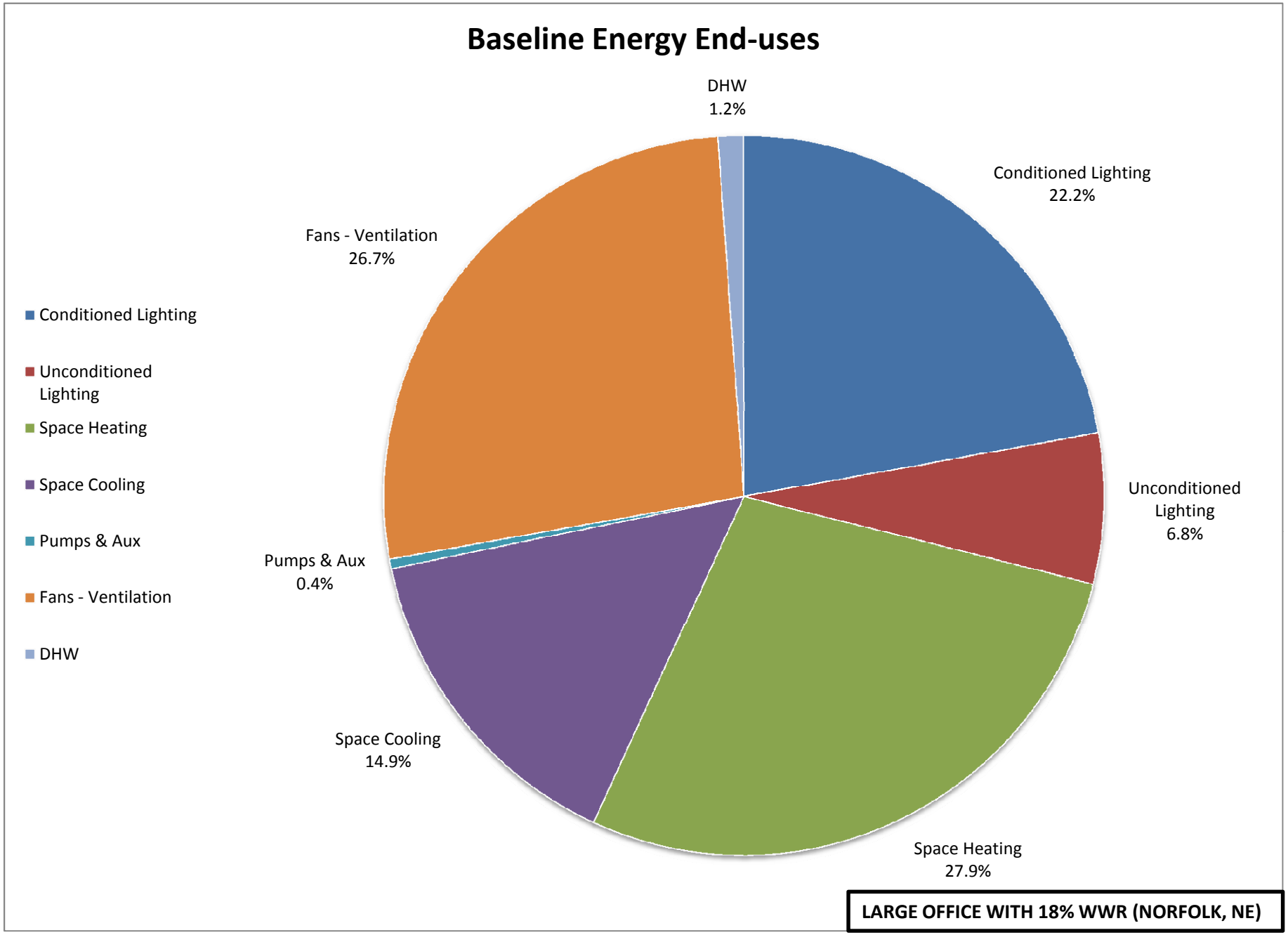
Run	Name	Annual Energy Use* [MMBtu]	Annual Energy Cost* [$]	Cost Savings vs. Avg. Base* [$]	Savings vs Avg. Base* [%]	Energy Use Reduction vs. Base* [MMBtu]	Energy Use Reduction vs. Base* [%]	Notes
0.00	Base Case	2599.4	$42,779					
	Base +90°	2630.7	$43,398					ASHRAE 90.1-2004 Baseline Appendix G
	Base +180°	2594.5	$42,745					Walls: U-0.084; Roof: U-0.063; Floors - U-0.052
	Base +270°	2630.6	$43,393					Windows: U-0.57, SHGC-0.39
	Avg Base Case	2613.8	$43,079					
1.10	2003 IECC	2558.2	$43,245	-$166	-0.4%	55.6	2.1%	1.10: 2003 IECC (Norfolk 14b)
1.11	2006 IECC	2555.1	$42,488	$591	1.4%	58.7	2.2%	1.11: 2006 IECC
1.20	Improved Fenestration	2481.2	$40,897	$2,182	5.1%	132.6	5.1%	1.20: PPG Solarban 70XL;
1.30	Improved Wall	2517.9	$41,976	$1,103	2.6%	95.9	3.7%	1.30: R-21+7.5ci Walls w/ stud derating
1.40	Improved Roof	2508.5	$41,923	$1,156	2.7%	105.3	4.0%	1.40: R-30 Roof
1.41	Improved Roof	2483.9	$41,694	$1,385	3.2%	129.9	5.0%	1.41: R-40 Roof
1.50	Composite Envelope	2309.0	$39,271	$3,808	8.8%	304.8	11.7%	1.50: Combination of envelope improvements: 1.20, 1.30, 1.40
1.51	Composite Envelope	2284.3	$39,043	$4,036	9.4%	329.5	12.6%	1.51: Combination of envelope improvements: 1.20, 1.30, 1.41
2.00	Daylighting controls	2422.5	$38,253	$4,826	11.2%	191.3	7.3%	2.00: Daylighting: Continuous Control
2.01	Daylighting controls	2314.2	$36,659	$6,420	14.9%	299.6	11.5%	2.01: 2.00 +1.20
2.02	Daylighting controls	2112.3	$34,783	$8,296	19.3%	501.5	19.2%	2.03: 2.00 + 1.51
2.10	Reduced LPD	2498.4	$40,319	$2,760	6.4%	115.4	4.4%	2.10: LPD=0.8 W/sf; T5 Lamps w/ Electronic Ballast
2.11	Reduced LPD	2204.0	$36,802	$6,277	14.6%	409.8	15.7%	2.11: 2.10 + 1.50
2.12	Reduced LPD	2158.7	$36,567	$6,512	15.1%	455.1	17.4%	2.12: 2.10 + 1.51
3.00	CEE Tier 1	2550.9	$41,728	$1,351	3.1%	62.9	2.4%	3.00: CEE Tier 1 HVAC equipment
3.01	CEE Tier 2	2539.1	$41,456	$1,623	3.8%	74.7	2.9%	3.01: CEE Tier 2 HVAC equipment
3.14	CEE Tier 1	2071.6	$33,909	$9,170	21.3%	542.2	20.7%	3.14: 1.51 + 2.00 + 3.00
3.18	CEE Tier 1	2151.0	$35,645	$7,434	17.3%	462.8	17.7%	3.18: 1.51 + 2.10 + 3.00
3.30	Enthalpy Wheel	2293.1	$40,746	$2,333	5.4%	320.7	12.3%	3.30: Enthalpy Wheel; Effectiveness - 76% Sensible, 74% Latent
3.40	Enthalpy Wheel	1886.3	$34,021	$9,058	21.0%	727.5	27.8%	3.40: 3.30 + 3.00 + 2.10 + 1.50

*Reported excluding Misc Equipment electrical end-use

Large Office 18% Glass Energy Results Summary
Norfolk, NE

Run	Name	Annual Energy Use* [MMBtu]	Annual Energy Cost* [$]	Cost Savings vs. Avg. Base* [$]	Savings vs Avg. Base* [%]	Energy Use Reduction vs. Base* [MMBtu]	Energy Use Reduction vs. Base* [%]	Notes
0.00	Base Case	2599.4	$42,779					
	Base +90°	2630.7	$43,398					ASHRAE 90.1-2004 Baseline Appendix G
	Base +180°	2594.5	$42,745					Walls: U-0.084; Roof: U-0.063; Floors - U-0.052
	Base +270°	2630.6	$43,393					Windows: U-0.57, SHGC-0.39
	Avg Base Case	2613.8	$43,079					
3.41	Enthalpy Wheel	1730.6	$30,301	$12,778	29.7%	883.2	33.8%	3.41: 3.30 + 3.00 + 2.10 + 2.00 + 1.50
3.50	VAV w/VSD	1936.8	$36,797	$6,282	14.6%	677.0	25.9%	3.50: PVAV w/ VSD + 3.00
3.51	VAV w/VSD	1846.6	$35,139	$7,940	18.4%	767.2	29.4%	3.51: 3.50 + 3.00 + 1.20
3.52	VAV w/VSD	1786.3	$34,108	$8,971	20.8%	827.5	31.7%	3.52: 3.50 + 3.00 + 1.40 + 1.20

*Reported excluding Misc Equipment electrical end-use


Baseline Energy End-uses
DHW
1.2%
Conditioned Lighting
22.2%
Fans - Ventilation
26.7%
Conditioned Lighting
Unconditioned Lighting
Space Heating
Space Cooling
Pumps & Aux
Fans - Ventilation
DHW
Unconditioned Lighting
6.8%
Pumps & Aux
0.4%
Space Cooling
14.9%
Space Heating
27.9%
LARGE OFFICE WITH 18% WWR (NORFOLK, NE)

Large Office 18% Glass Energy Results Summary
Norfolk, NE

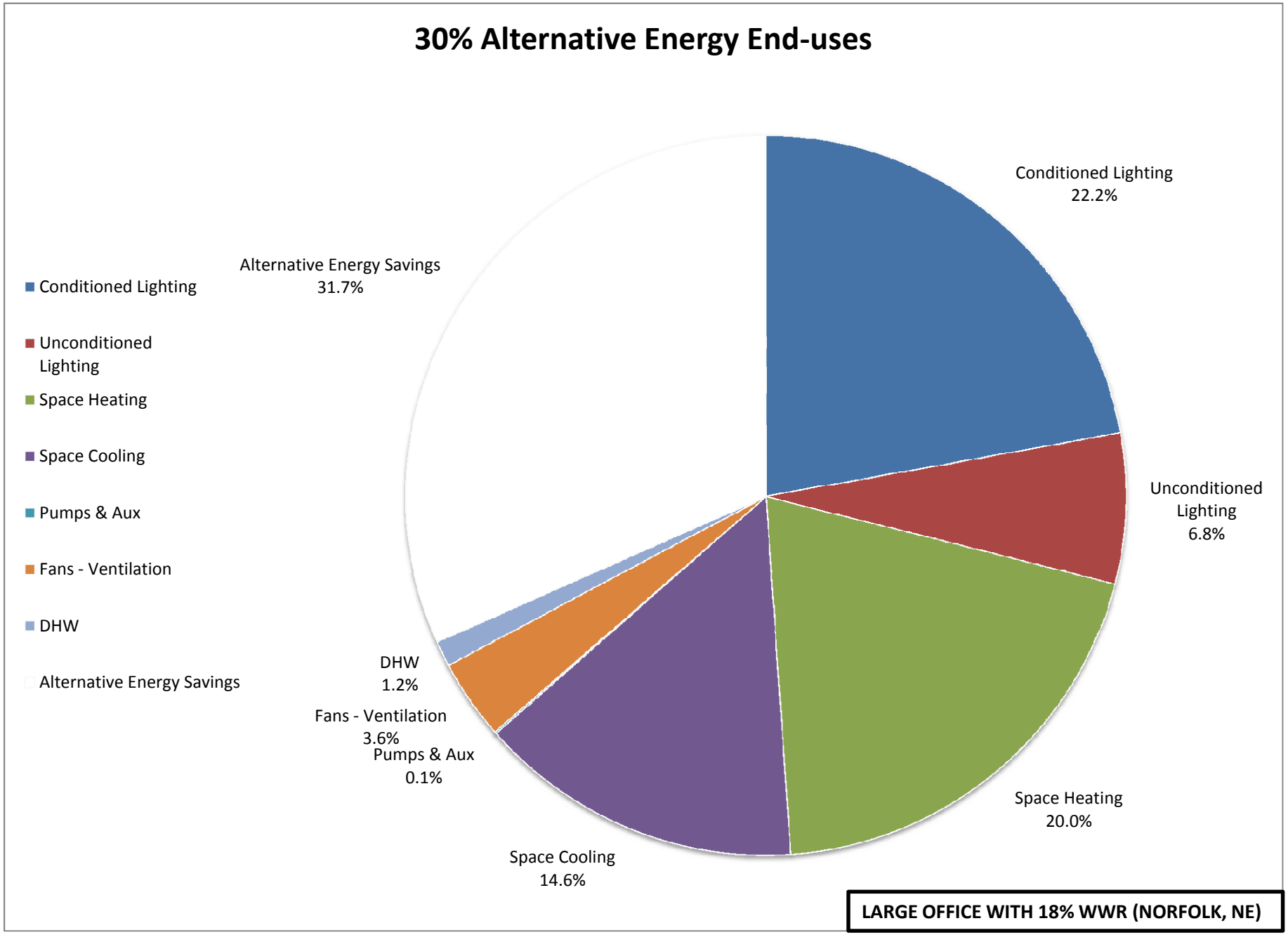
Building Energy Performance Summary - Base Case

End Use	*Energy Source*	*Baseline Building*		*Baseline Building +90*		*Baseline Building +180*		*Baseline Building +270*		*Baseline Average*		*% End Use of Baseline*
		Energy [MMBtu]	*Peak [kW or therm/hr]*	*Energy [MMBtu]*	*Peak [kW or therm/hr]*	*Energy [MMBtu]*	*Peak [kW or therm/hr]*	*Energy [MMBtu]*	*Peak [kW or therm/hr]*	*Energy [MMBtu]*	*Peak [kW or therm/hr]*	
Conditioned Lighting	Electricity	579.6	54.0	579.6	54.0	579.6	54.0	579.6	54.0	579.6	54.0	15.9%
Unconditioned Lighting	Electricity	176.6	12.0	176.6	12.0	176.6	12.0	176.6	12.0	176.6	12.0	4.9%
Misc Equipment	Electricity	1020.1	95.0	1020.1	95.0	1020.1	95.0	1020.1	95.0	1020.1	95.0	28.1%
Space Heating	Electricity									0.0	0.0	0.0%
Space Heating	Gas	732.1	18.0	730.0	18.0	726.4	18.0	730.2	18.0	729.7	18.0	20.1%
Space Heating	Steam/ HW									0.0	0.0	0.0%
Space Cooling	Electricity	386.1	137.6	393.9	137.2	385.4	137.4	393.9	137.2	389.8	137.4	10.7%
Space Cooling	CHW									0.0	0.0	0.0%
Heat Rejection	Electricity									0.0	0.0	0.0%
Pumps & Aux	Electricity	11.2	0.8	11.2	0.8	11.2	0.8	11.2	0.8	11.2	0.8	0.3%
Fans - Ventilation	Electricity	683.7	34.1	709.3	35.2	685.2	34.1	709.0	35.2	696.8	34.7	19.2%
Fans - Exhaust	Electricity									0.0	0.0	0.0%
Refrigeration	Electricity									0.0	0.0	0.0%
HP Supplement	Electricity									0.0	0.0	0.0%
DHW	Elec	30.1	3.6	30.1	3.6	30.1	3.6	30.1	3.6	30.1	3.6	0.8%
DHW	Gas									0.0	0.0	0.0%
Total w/o Misc Equipment		2599.4		2630.7		2594.5		2630.6		2613.8		
Total w/ Misc Equipment		3619.5		3650.8		3614.6		3650.7		3633.9		

Energy Cost Summary

Energy Source	*Baseline Cost*	*Baseline Cost +90*	*Baseline Cost +180*	*Baseline Cost +270*	**Baseline Average**
Electricity	$36,530	$37,166	$36,543	$37,160	**$36,850**
Gas	$6,249	$6,232	$6,202	$6,233	**$6,229**
Steam/ HW					**$0**
Chilled Water					**$0**
Total	**$42,779**	**$43,398**	**$42,745**	**$43,393**	**$43,079**

*Electricity cost excludes Misc Equipment electrical consumption cost (based upon virtual rate)
DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms


30% Alternative Energy End-uses
Conditioned Lighting
Unconditioned Lighting
Space Heating
Space Cooling
Pumps & Aux
Fans - Ventilation
DHW
Alternative Energy Savings
Alternative Energy Savings
31.7%
Conditioned Lighting
22.2%
Unconditioned
Lighting
6.8%
Space Heating
20.0%
Space Cooling
14.6%
Pumps & Aux
0.1%
Fans - Ventilation
3.6%
DHW
1.2%
LARGE OFFICE WITH 18% WWR (NORFOLK, NE)

Large Office 18% Glass Energy Results Summary
Norfolk, NE

Description: 3.52: 3.50 + 3.00 + 1.40 + 1.20
Packaged VAV w/ VSD, electric terminal reheat; CEE Tier 1 cooling efficiencies; R-30 roof; Solarban 70XL fenestration w/ thermally broken frame

Building Energy Performance Summary

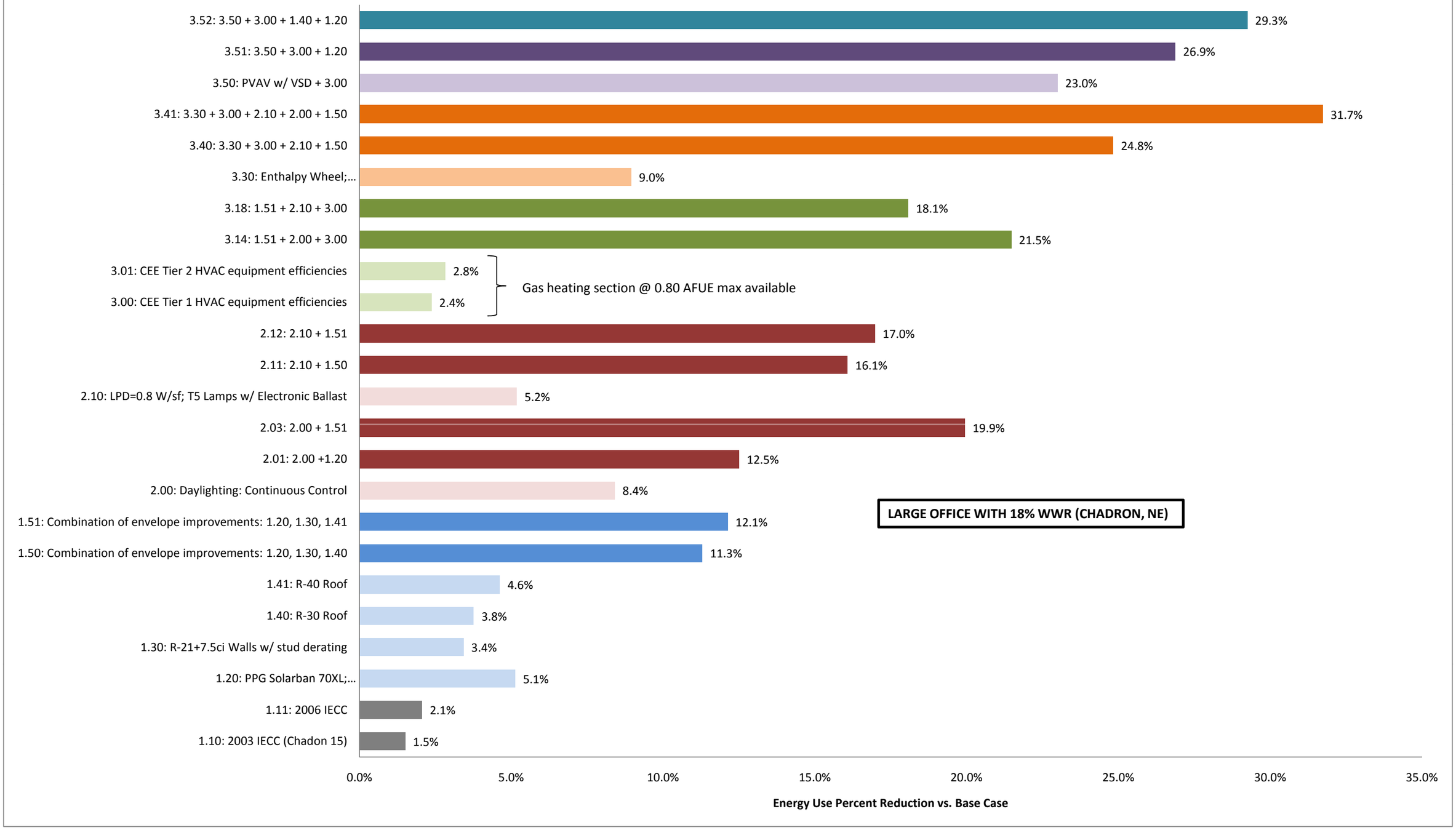
End Use	*Energy Source*	*Alternative Building*		*Average Baseline*		*Energy Difference Alt-Baseline*	*% of End Use of As Designed*	*Baseline Consumption Average*
		Energy [MMBtu]	*Peak [kW or therm/hr]*	*Energy [MMBtu]*	*Peak [kW or therm/hr]*	*[%]*	*[%]*	*[%]*
Conditioned Lighting	Electricity	579.6	54.0	579.6	54.0	0.0%	20.7%	15.9%
Unconditioned Lighting	Electricity	176.6	12.0	176.6	12.0	0.0%	6.3%	4.9%
Misc Equipment	Electricity	1020.1	95.0	1020.1	95.0	0.0%	36.3%	28.1%
Space Heating	Electricity	521.7	531.0	0.0	0.0		18.6%	0.0%
Space Heating	Gas			729.7	18.0	100.0%	0.0%	20.1%
Space Heating	Steam/ HW			0.0	0.0		0.0%	0.0%
Space Cooling	Elec	381.7	114.8	389.8	137.4	2.1%	13.6%	10.7%
Space Cooling	Chilled Water			0.0	0.0		0.0%	0.0%
Heat Rejection	Electricity			0.0	0.0		0.0%	0.0%
Pumps & Aux	Electricity	2.2	0.2	11.2	0.8	80.4%	0.1%	0.3%
Fans - Ventilation	Electricity	94.3	38.3	696.8	34.7	86.5%	3.4%	19.2%
Fans - Exhaust	Electricity			0.0	0.0		0.0%	0.0%
Refrigeration	Electricity			0.0	0.0		0.0%	0.0%
HP Supplement	Electricity			0.0	0.0		0.0%	0.0%
DHW	Elec	30.2	3.6	30.1	3.6	-0.3%	1.1%	0.8%
DHW	Gas			0.0	0.0		0.0%	0.0%
Total w/o Misc Equipment		**1786.3**		**2613.8**		**31.7%**	100.0%	100.0%
Alternative Energy Savings		**827.5**						
Total w/ Misc Equipment		2806.4		3633.9				

Energy Cost Summary

Energy Source	*As Designed Cost*	*Baseline Cost*
Electricity	$33,904	$36,850
Gas	$204	$6,229
Steam/ HW		$0
Chilled Water		$0
Total	**$34,108**	**$43,079**

*Electricity cost excludes Misc Equipment electrical consumption cost (based upon virtual rate)
DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms

Alternative Energy Savings vs. ASHRAE 90.1-2004 Base Case



Large Office 18% Glass Energy Results Summary
Chadron, NE

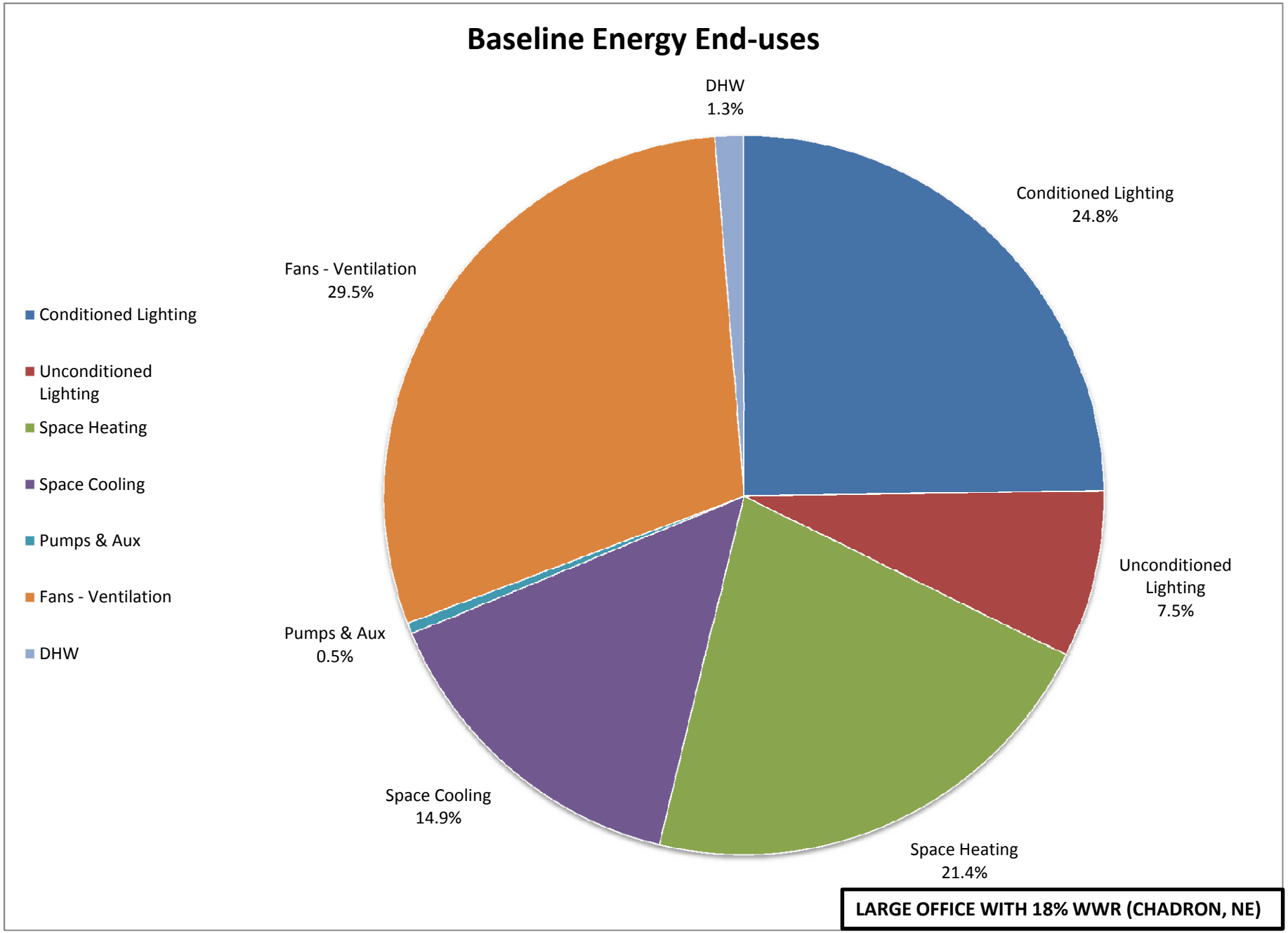
Run	Name	Annual Energy Use* [MMBtu]	Annual Energy Cost* [$]	Cost Savings vs. Avg. Base* [$]	Savings vs Avg. Base* [%]	Energy Use Reduction vs. Base* [MMBtu]	Energy Use Reduction vs. Base* [%]	Notes
0.00	Base Case	2326.9	$39,898					
	Base +90°	2354.3	$40,551					ASHRAE 90.1-2004 Baseline
	Base +180°	2320.9	$39,851					Appendix G
	Base +270°	2354.9	$40,561					Walls: U-0.084; Roof: U-0.063; Floors - U-0.052
	Avg Base Case	2339.25	$40,215					Windows: U-0.57, SHGC-0.39
1.10	2003 IECC	2303.9	$40,500	-$285	-0.7%	35.35	1.5%	1.10: 2003 IECC (Chadon 15)
1.11	2006 IECC	2291.0	$39,662	$553	1.4%	48.25	2.1%	1.11: 2006 IECC
1.20	Improved Fenestration	2219.2	$38,103	$2,112	5.3%	120.05	5.1%	1.20: PPG Solarban 70XL;
1.30	Improved Wall	2259.0	$39,230	$985	2.5%	80.25	3.4%	1.30: R-21+7.5ci Walls w/ stud
1.40	Improved Roof	2251.3	$39,143	$1,072	2.7%	87.95	3.8%	1.40: R-30 Roof
1.41	Improved Roof	2231.1	$38,946	$1,269	3.2%	108.15	4.6%	1.41: R-40 Roof
1.50	Composite Envelope	2075.1	$36,672	$3,543	8.8%	264.15	11.3%	1.50: Combination of envelope improvements: 1.20, 1.30, 1.40
1.51	Composite Envelope	2055.5	$36,480	$3,735	9.3%	283.75	12.1%	1.51: Combination of envelope improvements: 1.20, 1.30, 1.41
2.00	Daylighting controls	2142.5	$35,402	$4,813	12.0%	196.75	8.4%	2.00: Daylighting: Continuous
2.01	Daylighting controls	2046.7	$33,890	$6,325	15.7%	292.55	12.5%	2.01: 2.00 +1.20
2.02	Daylighting controls	1872.7	$32,221	$7,994	19.9%	466.55	19.9%	2.03: 2.00 + 1.51
2.10	Reduced LPD	2218.1	$37,417	$2,798	7.0%	121.15	5.2%	2.10: LPD=0.8 W/sf; T5 Lamps w/ Electronic Ballast
2.11	Reduced LPD	1963.2	$34,176	$6,039	15.0%	376.05	16.1%	2.11: 2.10 + 1.50
2.12	Reduced LPD	1942.1	$33,971	$6,244	15.5%	397.15	17.0%	2.12: 2.10 + 1.51
3.00	CEE Tier 1	2283.7	$38,906	$1,309	3.3%	55.55	2.4%	3.00: CEE Tier 1 HVAC
3.01	CEE Tier 2	2273.1	$38,724	$1,492	3.7%	66.15	2.8%	3.01: CEE Tier 2 HVAC
3.14	CEE Tier 1	1837.0	$31,431	$8,785	21.8%	502.25	21.5%	3.14: 1.51 + 2.00 + 3.00
3.18	CEE Tier 1	1916.4	$33,161	$7,055	17.5%	422.85	18.1%	3.18: 1.51 + 2.10 + 3.00

*Reported excluding Misc Equipment electrical end-use

Large Office 18% Glass Energy Results Summary
Chadron, NE

Run	Name	Annual Energy Use* [MMBtu]	Annual Energy Cost* [$]	Cost Savings vs. Avg. Base* [$]	Savings vs Avg. Base* [%]	Energy Use Reduction vs. Base* [MMBtu]	Energy Use Reduction vs. Base* [%]	Notes
0.00	Base Case	2326.9	$39,898					
	Base +90°	2354.3	$40,551					ASHRAE 90.1-2004 Baseline Appendix G
	Base +180°	2320.9	$39,851					Walls: U-0.084; Roof: U-0.063; Floors - U-0.052
	Base +270°	2354.9	$40,561					
	Avg Base Case	2339.25	$40,215					Windows: U-0.57, SHGC-0.39
3.30	Enthalpy Wheel	2129.8	$38,491	$1,724	4.3%	209.45	9.0%	3.30: Enthalpy Wheel; Effectiveness - 76% Sensible, 74% Latent
3.40	Enthalpy Wheel	1758.5	$32,223	$7,993	19.9%	580.75	24.8%	3.40: 3.30 + 3.00 + 2.10 + 1.50
3.41	Enthalpy Wheel	1596.9	$28,725	$11,491	28.6%	742.35	31.7%	3.41: 3.30 + 3.00 + 2.10 + 2.00
3.50	VAV w/VSD	1801.4	$34,118	$6,097	15.2%	537.85	23.0%	3.50: PVAV w/ VSD + 3.00
3.51	VAV w/VSD	1710.6	$32,485	$7,730	19.2%	628.65	26.9%	3.51: 3.50 + 3.00 + 1.20
3.52	VAV w/VSD	1655.0	$31,489	$8,726	21.7%	684.25	29.3%	3.52: 3.50 + 3.00 + 1.40 + 1.20

*Reported excluding Misc Equipment electrical end-use


Baseline Energy End-uses
DHW
1.3%
Conditioned Lighting
24.8%
Fans - Ventilation
29.5%
Conditioned Lighting
Unconditioned Lighting
Space Heating
Space Cooling
Pumps & Aux
Fans - Ventilation
DHW
Unconditioned Lighting
7.5%
Pumps & Aux
0.5%
Space Cooling
14.9%
Space Heating
21.4%
LARGE OFFICE WITH 18% WWR (CHADRON, NE)

Large Office 18% Glass Energy Results Summary
Chadron, NE

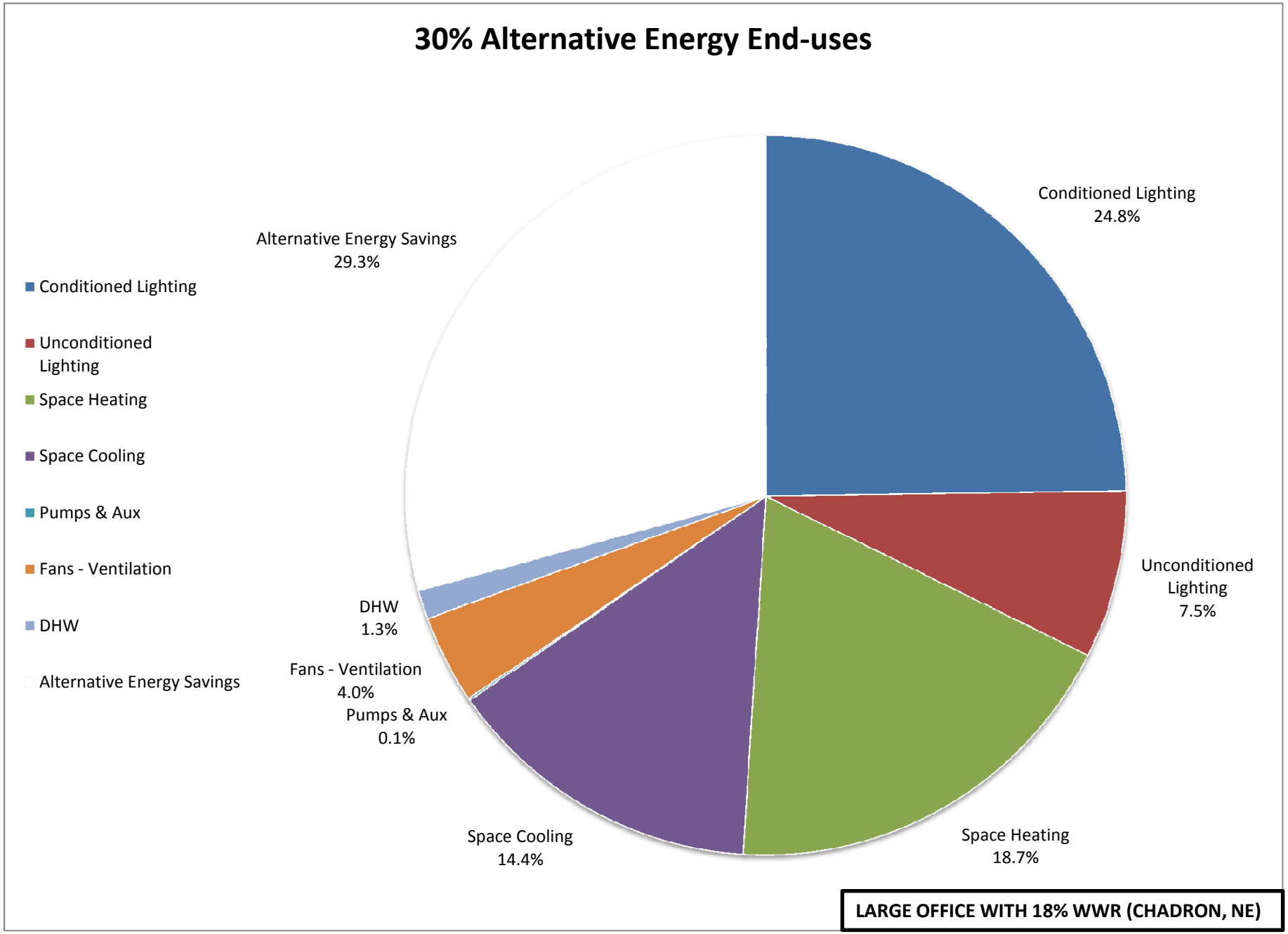
Building Energy Performance Summary - Base Case

End Use	*Energy Source*	*Baseline Building*		*Baseline Building +90*		*Baseline Building +180*		*Baseline Building +270*		*Baseline Average*		*% End Use of Baseline*
		Energy [MMbtu]	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	
Conditioned Lighting	Electricity	579.6	54.0	579.6	54.0	579.6	54.0	579.6	54.0	579.6	54.0	17.3%
Unconditioned Lighting	Electricity	176.6	12.0	176.6	12.0	176.6	12.0	176.6	12.0	176.6	12.0	5.3%
Misc Equipment	Electricity	1020.1	95.0	1020.1	95.0	1020.1	95.0	1020.1	95.0	1020.1	95.0	30.4%
Space Heating	Electricity									0.0	0.0	0.0%
Space Heating	Gas	508.4	15.0	498.1	15.0	501.5	15.0	498.3	15.0	501.6	15.0	14.9%
Space Heating	Steam/ HW									0.0	0.0	0.0%
Space Cooling	Electricity	343.7	123.9	356.0	127.9	343.0	123.7	356.1	127.8	349.7	125.8	10.4%
Space Cooling	CHW									0.0	0.0	0.0%
Heat Rejection	Electricity									0.0	0.0	0.0%
Pumps & Aux	Electricity	11.8	0.8	11.8	0.8	11.8	0.8	11.8	0.8	11.8	0.8	0.4%
Fans - Ventilation	Electricity	676.7	34.3	702.1	35.5	678.3	34.4	702.4	35.5	689.9	34.9	20.5%
Fans - Exhaust	Electricity									0.0	0.0	0.0%
Refrigeration	Electricity									0.0	0.0	0.0%
HP Supplement	Electricity									0.0	0.0	0.0%
DHW	Elec	30.1	3.4	30.1	3.4	30.1	3.4	30.1	3.4	30.1	3.4	0.9%
DHW	Gas									0.0	0.0	0.0%
Total w/o Misc Equipment		2326.9		2354.3		2320.9		2354.9		2339.25		
Total w/ Misc Equipment		3347.0		3374.4		3341.0		3375.0		3359.35		

Energy Cost Summary

Energy Source	*Baseline Cost*	*Baseline Cost +90*	*Baseline Cost +180*	*Baseline Cost +270*	**Baseline Average**
Electricity*	$35,495	$36,237	$35,508	$36,246	**$35,872**
Gas	$4,403	$4,314	$4,343	$4,315	**$4,344**
Steam/ HW					**$0**
Chilled Water					**$0**
Total	**$39,898**	**$40,551**	**$39,851**	**$40,561**	**$40,215**

*Electricity cost excludes Misc Equipment electrical consumption cost (based upon virtual rate)
DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms


30% Alternative Energy End-uses
Conditioned Lighting
Unconditioned Lighting
Space Heating
Space Cooling
Pumps & Aux
Fans - Ventilation
DHW
Alternative Energy Savings
Alternative Energy Savings 29.3%
Conditioned Lighting 24.8%
Unconditioned Lighting 7.5%
Space Heating 18.7%
Space Cooling 14.4%
Pumps & Aux 0.1%
Fans - Ventilation 4.0%
DHW 1.3%
LARGE OFFICE WITH 18% WWR (CHADRON, NE)

Large Office 18% Glass Energy Results Summary
Chadron, NE

Description: 3.52: 3.50 + 3.00 + 1.40 + 1.20
Packaged VAV w/ VSD, electric terminal reheat; CEE Tier 1 cooling efficiencies; R-30 roof; Solarban 70XL fenestration w/ thermally broken frame

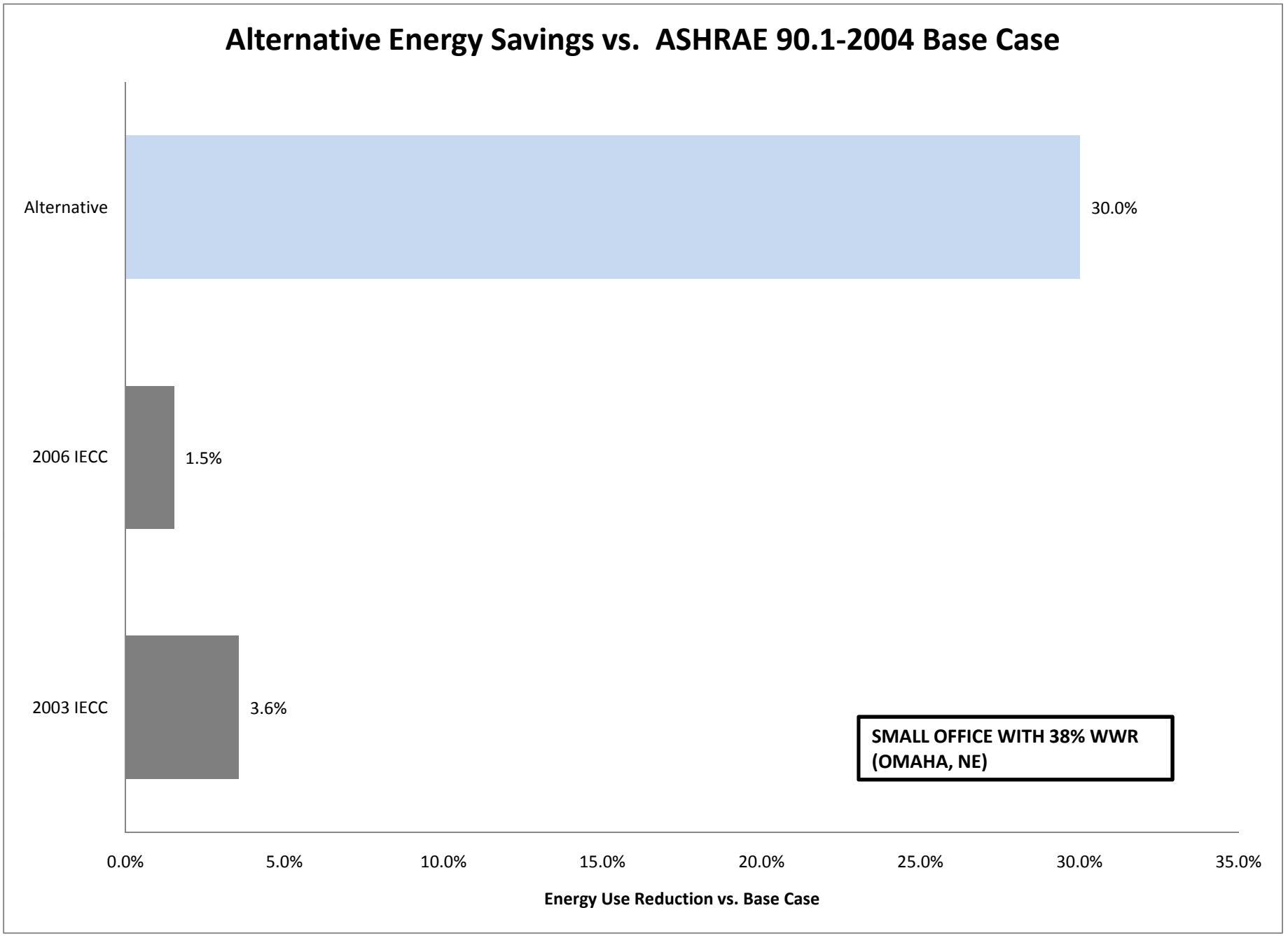
Building Energy Performance Summary

End Use	*Energy Source*	*Alternative Building*		*Average Baseline*		*Energy Difference Alt-Baseline*	*% of End Use of As Designed*	*Baseline Consumption Average*
		Energy [MMbtu]	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	*[%]*	*[%]*	*[%]*
Conditioned Lighting	Electricity	579.6	54.0	579.6	54.0	0.0%	21.7%	17.3%
Unconditioned Lighting	Electricity	176.6	12.0	176.6	12.0	0.0%	6.6%	5.3%
Misc Equipment	Electricity	1020.1	95.0	1020.1	95.0	0.0%	38.1%	30.4%
Space Heating	Electricity	436.4	586.1	0.0	0.0		16.3%	0.0%
Space Heating	Gas			501.6	15.0	100.0%	0.0%	14.9%
Space Heating	Steam/ HW			0.0	0.0		0.0%	0.0%
Space Cooling	Elec	336.0	102.0	349.7	125.8	3.9%	12.6%	10.4%
Space Cooling	Chilled Water			0.0	0.0		0.0%	0.0%
Heat Rejection	Electricity			0.0	0.0		0.0%	0.0%
Pumps & Aux	Electricity	2.3	0.2	11.8	0.8	80.5%	0.1%	0.4%
Fans - Ventilation	Electricity	93.9	41.7	689.9	34.9	86.4%	3.5%	20.5%
Fans - Exhaust	Electricity			0.0	0.0		0.0%	0.0%
Refrigeration	Electricity			0.0	0.0		0.0%	0.0%
HP Supplement	Electricity			0.0	0.0		0.0%	0.0%
DHW	Elec	30.2	3.4	30.1	3.4	-0.3%	1.1%	0.9%
DHW	Gas			0.0	0.0		0.0%	0.0%
Total w/o Misc Equipment		**1655.0**		**2339.3**		**29.3%**	100.0%	100.0%
Alternative Energy Savings		**684.3**						
Total w/ Misc Equipment		2675.1		3359.4		20.4%		

Energy Cost Summary

Energy Source	*As Designed Cost*	*Baseline Cost*
Electricity*	$31,489	$35,872
Gas	$0	$4,344
Steam/ HW		$0
Chilled Water		$0
Total	**$31,489**	**$40,215**

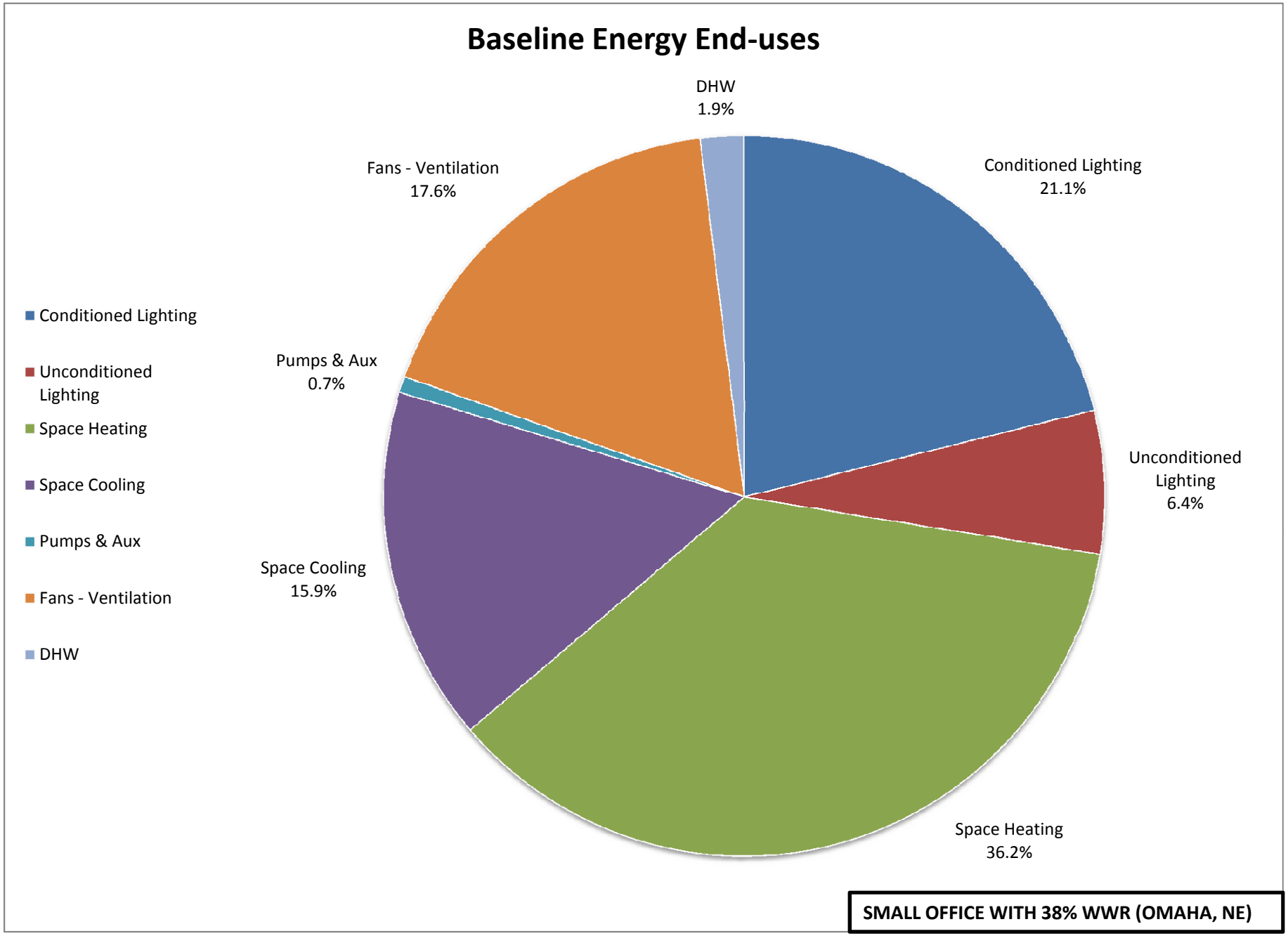
*Electricity cost excludes Misc Equipment electrical consumption cost (based upon virtual rate)
DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms


Alternative Energy Savings vs. ASHRAE 90.1-2004 Base Case
Alternative
30.0%
2006 IECC
1.5%
2003 IECC
3.6%
SMALL OFFICE WITH 38% WWR
(OMAHA, NE)
0.0%
5.0%
10.0%
15.0%
20.0%
25.0%
30.0%
35.0%
Energy Use Reduction vs. Base Case

Small Office 38% Glass Energy Results Summary
Omaha, NE

Run	Name	Annual Energy Use* [MMBtu]	Annual Energy Cost* [$]	Cost Savings vs. Avg. Base* [$]	Savings vs Avg. Base* [%]	Energy Use Reduction vs. Base* [MMBtu]	Energy Use Reduction vs. Base* [%]	Notes
0.00	Base Case	453.4	$7,522					
	Base +90°	461.2	$7,664					ASHRAE 90.1-2004 Baseline Appendix G
	Base +180°	452.6	$7,492					Walls: U-0.084; Roof: U-0.063; Floors - U-0.052
	Base +270°	461.2	$7,644					
	Avg Base Case	457.1	$7,580					Windows: U-0.57, SHGC-0.39
1.10	2003 IECC	440.8	$7,499	$81	1.1%	16.3	3.6%	1.10: 2003 IECC (Omaha 13b)
1.11	2006 IECC	450.1	$7,582	-$1	0.0%	7.0	1.5%	1.11: 2006 IECC
3.42	Alternative	319.9	$5,654	$1,926	25.4%	137.2	30.0%	Split System w/ dedicated ERV; 90% eff. furnace; CEE Tier 1; LPD=0.8 W/sf; R-21+7.5ci wall, R-40 roof, Solarban 80 w/ thermally broken frame

*Reported excluding Misc Equipment electrical end-use


Baseline Energy End-uses
DHW
1.9%
Conditioned Lighting
21.1%
Fans - Ventilation
17.6%
Pumps & Aux
0.7%
Unconditioned
Lighting
6.4%
Space Cooling
15.9%
Space Heating
36.2%
Conditioned Lighting
Unconditioned
Lighting
Space Heating
Space Cooling
Pumps & Aux
Fans - Ventilation
DHW
SMALL OFFICE WITH 38% WWR (OMAHA, NE)

Small Office 38% Glass Energy Results Summary
Omaha, NE

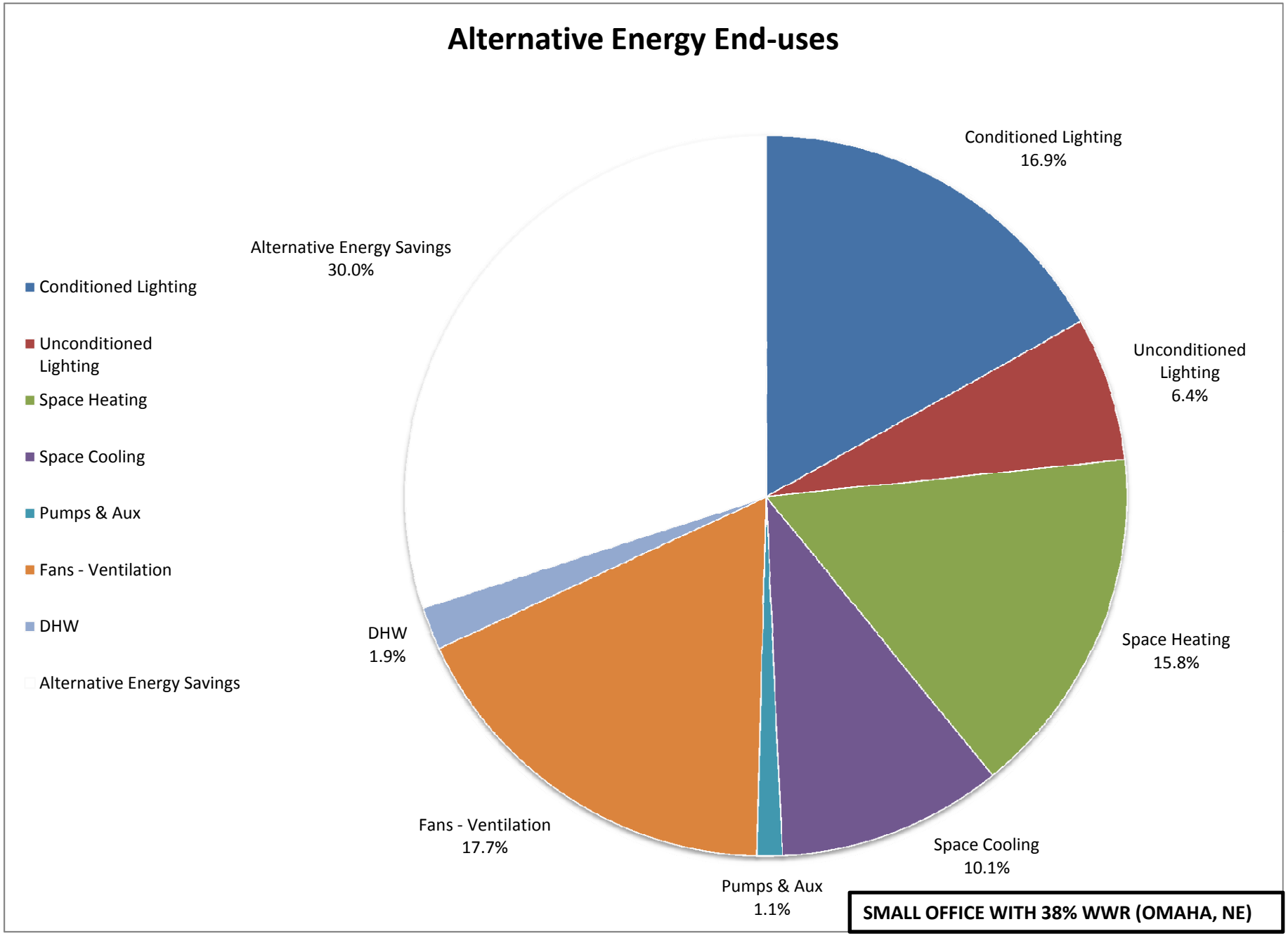
Building Energy Performance Summary - Base Case

End Use	*Energy Source*	*Baseline Building*		*Baseline Building +90*		*Baseline Building +180*		*Baseline Building +270*		*Baseline Average*		*% End Use of Baseline*
		Energy [MMbtu]	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	
Conditioned Lighting	Electricity	96.6	9.0	96.6	9.0	96.6	9.0	96.6	9.0	96.6	9.0	15.7%
Unconditioned Lighting	Electricity	29.4	2.0	29.4	2.0	29.4	2.0	29.4	2.0	29.4	2.0	4.8%
Misc Equipment	Electricity	157.5	14.7	157.5	14.7	157.5	14.7	157.5	14.7	157.5	14.7	25.6%
Space Heating	Electricity									0.0	0.0	0.0%
Space Heating	Gas	164.0	7.0	166.5	7.0	164.6	7.0	166.4	7.0	165.4	7.0	26.9%
Space Heating	Steam/ HW									0.0	0.0	0.0%
Space Cooling	Electricity	72.3	29.2	74.2	30.0	70.7	28.9	74.3	29.9	72.9	29.5	11.9%
Space Cooling	CHW									0.0	0.0	0.0%
Heat Rejection	Electricity									0.0	0.0	0.0%
Pumps & Aux	Electricity	3.3	0.3	3.3	0.3	3.3	0.3	3.3	0.3	3.3	0.3	0.5%
Fans - Ventilation	Electricity	78.9	7.5	82.3	7.8	79.1	7.5	82.3	7.8	80.7	7.7	13.1%
Fans - Exhaust	Electricity									0.0	0.0	0.0%
Refrigeration	Electricity									0.0	0.0	0.0%
HP Supplement	Electricity									0.0	0.0	0.0%
DHW	Elec									0.0	0.0	0.0%
DHW	Gas	8.9	0.0	8.9	0.0	8.9	0.0	8.9	0.0	8.9	0.0	1.4%
Total w/o Misc Equipment		453.4		461.2		452.6		461.2		457.1		
Total w/ Misc Equipment		610.9		618.7		610.1		618.7		614.6		

Energy Cost Summary

Energy Source	*Baseline Cost*	*Baseline Cost +90*	*Baseline Cost +180*	*Baseline Cost +270*	**Baseline Average**
Electricity*	$5,697	$5,816	$5,663	$5,796	**$5,743**
Gas	$1,825	$1,848	$1,829	$1,848	**$1,838**
Steam/ HW					**$0**
Chilled Water					**$0**
Total	**$7,522**	**$7,664**	**$7,492**	**$7,644**	**$7,580**

*Electricity cost excludes Misc Equipment electrical consumption cost (based upon virtual rate)
DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms


Alternative Energy End-uses
Conditioned Lighting
16.9%
Unconditioned
Lighting
6.4%
Space Heating
15.8%
Space Cooling
10.1%
Pumps & Aux
1.1%
Fans - Ventilation
17.7%
DHW
1.9%
Alternative Energy Savings
30.0%
Conditioned Lighting
Unconditioned
Lighting
Space Heating
Space Cooling
Pumps & Aux
Fans - Ventilation
DHW
Alternative Energy Savings
SMALL OFFICE WITH 38% WWR (OMAHA, NE)

Small Office 38% Glass Energy Results Summary
Omaha, NE

Description: 3.42: 3.30 + 3.02 + 3.00 + 2.10 + 1.51 (with Solarban 80 Fenestration replacing Solarban 70XL)
Split System w/ dedicated ERV; 90% eff. furnace; CEE Tier 1; LPD=0.8 W/sf; R-21+7.5ci wall, R-40 roof, Solarban 80 w/ thermally broken frame

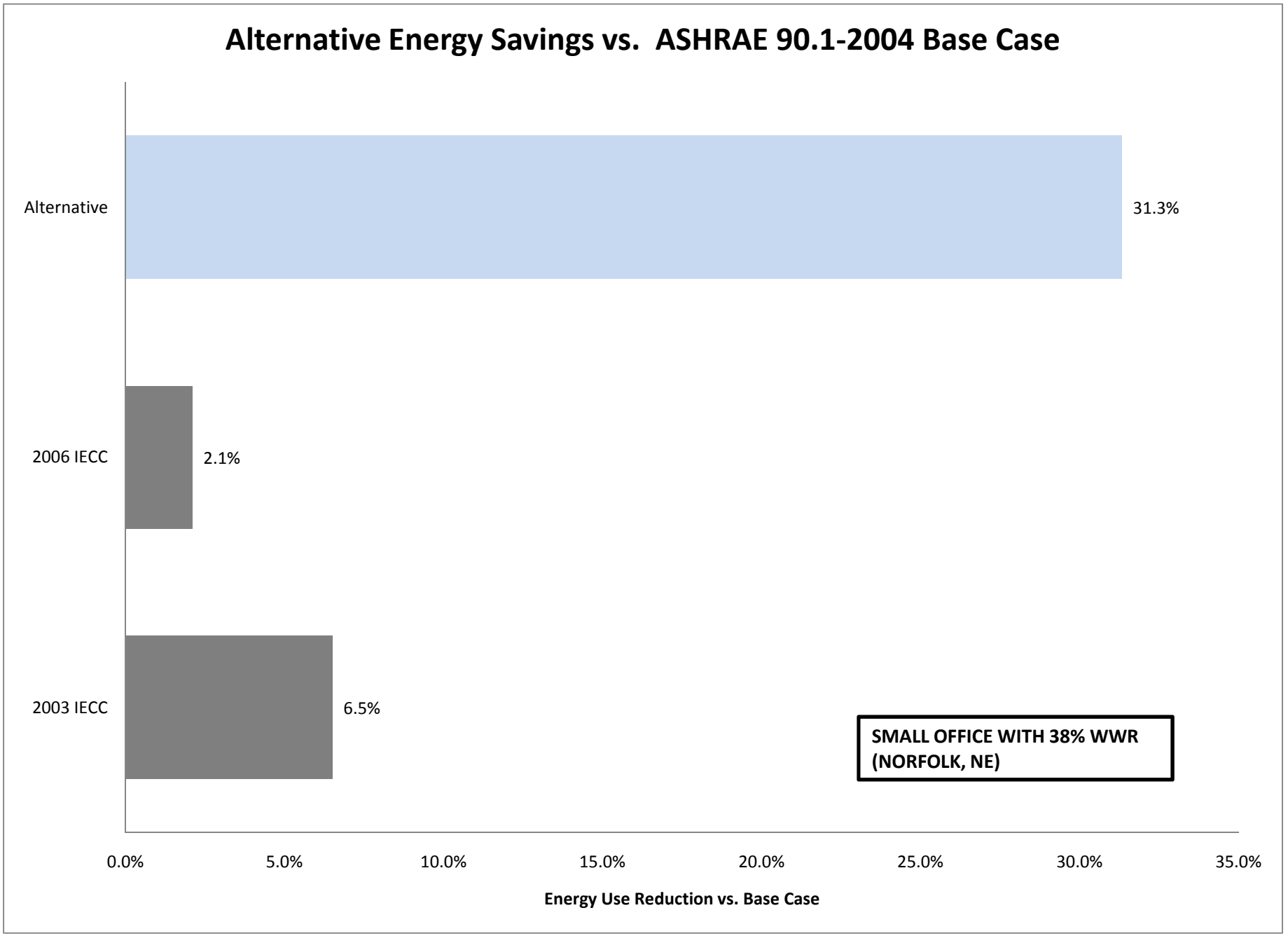
Building Energy Performance Summary **Alternative**

End Use	*Energy Source*	*Alternative Building*		*Average Baseline*		*Energy Difference Alt-Baseline*	*% of End Use of As Designed*	*Baseline Consumption Average*
		Energy [MMBtu]	*Peak [kW or therm/hr]*	*Energy [MMBtu]*	*Peak [kW or therm/hr]*	*[%]*	*[%]*	*[%]*
Conditioned Lighting	Electricity	77.3	7.2	96.6	9.0	20.0%	24.2%	21.1%
Unconditioned Lighting	Electricity	29.4	2.0	29.4	2.0	0.0%	9.2%	6.4%
Misc Equipment	Electricity	157.5	14.7	157.5	14.7	0.0%	49.2%	34.5%
Space Heating	Electricity			0.0	0.0		0.0%	0.0%
Space Heating	Gas	72.2	0.5	165.4	7.0	56.3%	22.6%	36.2%
Space Heating	Steam/ HW			0.0	0.0		0.0%	0.0%
Space Cooling	Elec	46.2	16.5	72.9	29.5	36.6%	14.4%	15.9%
Space Cooling	Chilled Water			0.0	0.0		0.0%	0.0%
Heat Rejection	Electricity			0.0	0.0		0.0%	0.0%
Pumps & Aux	Electricity	5.2	0.3	3.3	0.3	-57.6%	1.6%	0.7%
Fans - Ventilation	Electricity	80.8	6.9	80.7	7.7	-0.2%	25.3%	17.6%
Fans - Exhaust	Electricity			0.0	0.0		0.0%	0.0%
Refrigeration	Electricity			0.0	0.0		0.0%	0.0%
HP Supplement	Electricity			0.0	0.0		0.0%	0.0%
DHW	Elec			0.0	0.0		0.0%	0.0%
DHW	Gas	8.8	0.0	8.9	0.0	1.1%	2.8%	1.9%
Total w/o Misc Equipment		**319.9**		**457.1**		**30.0%**	100.0%	100.0%
Alternative Energy Savings		**137.2**						
Total w/ Misc Equipment		477.4		614.6		22.3%		

Energy Cost Summary

Energy Source	*As Designed Cost*	*Baseline Cost*
Electricity*	$4,693	$5,743
Gas	$961	$1,838
Steam/ HW		$0
Chilled Water		$0
Total	**$5,654**	**$7,580**

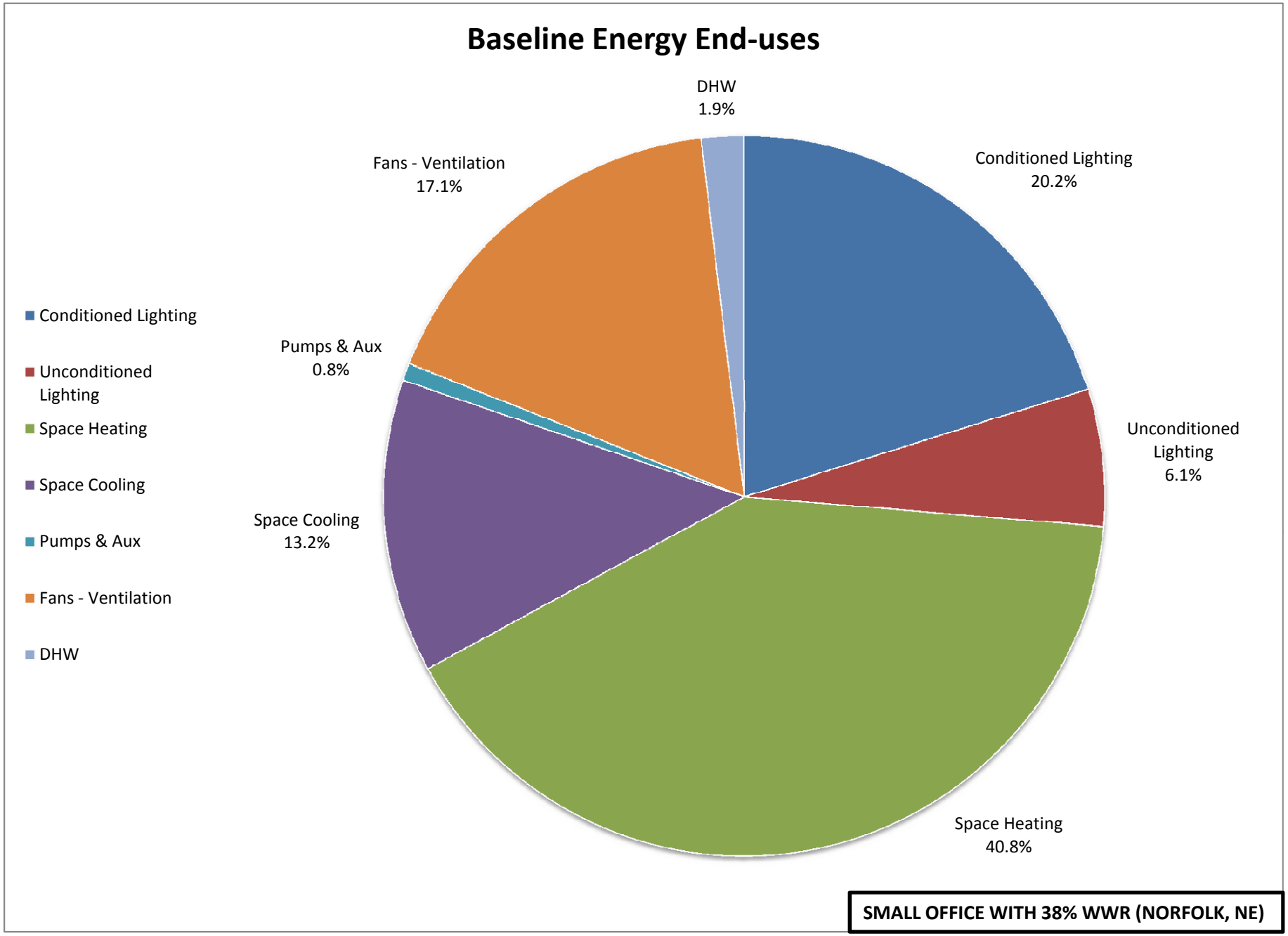
*Electricity cost excludes Misc Equipment electrical consumption cost (based upon virtual rate)
DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms


Alternative Energy Savings vs. ASHRAE 90.1-2004 Base Case
Alternative
31.3%
2006 IECC
2.1%
2003 IECC
6.5%
SMALL OFFICE WITH 38% WWR
(NORFOLK, NE)
0.0%
5.0%
10.0%
15.0%
20.0%
25.0%
30.0%
35.0%
Energy Use Reduction vs. Base Case

Small Office 38% Glass Energy Results Summary
Norfolk, NE

Run	Name	Annual Energy Use* [MMBtu]	Annual Energy Cost* [$]	Cost Savings vs. Avg. Base* [$]	Savings vs Avg. Base* [%]	Energy Use Reduction vs. Base* [MMBtu]	Energy Use Reduction vs. Base* [%]	Notes
0.00	Base Case	474.5	$7,435					
	Base +90°	483.7	$7,590					ASHRAE 90.1-2004 Baseline Appendix G
	Base +180°	473.8	$7,414					Walls: U-0.084; Roof: U-0.063; Floors - U-0.052
	Base +270°	483.8	$7,593					
	Avg Base Case	478.95	$7,508					Windows: U-0.57, SHGC-0.39
1.10	2003 IECC	447.8	$7,326	$182	2.4%	31.1	6.5%	1.10: 2003 IECC (Norfolk 14b)
1.11	2006 IECC	468.9	$7,474	$34	0.5%	10.1	2.1%	1.11: 2006 IECC
3.42	Alternative	328.9	$5,763	$1,745	23.2%	150.1	31.3%	3.42: 3.30 + 3.02 + 3.00 + 2.10 + 1.51 (with Solarban 80 Fenestration replacing Solarban 70XL)

*Reported excluding Misc Equipment electrical end-use


Baseline Energy End-uses
DHW
1.9%
Conditioned Lighting
20.2%
Fans - Ventilation
17.1%
Pumps & Aux
0.8%
Unconditioned
Lighting
6.1%
Space Cooling
13.2%
Space Heating
40.8%
Conditioned Lighting
Unconditioned
Lighting
Space Heating
Space Cooling
Pumps & Aux
Fans - Ventilation
DHW
SMALL OFFICE WITH 38% WWR (NORFOLK, NE)

Small Office 38% Glass Energy Results Summary
Norfolk, NE

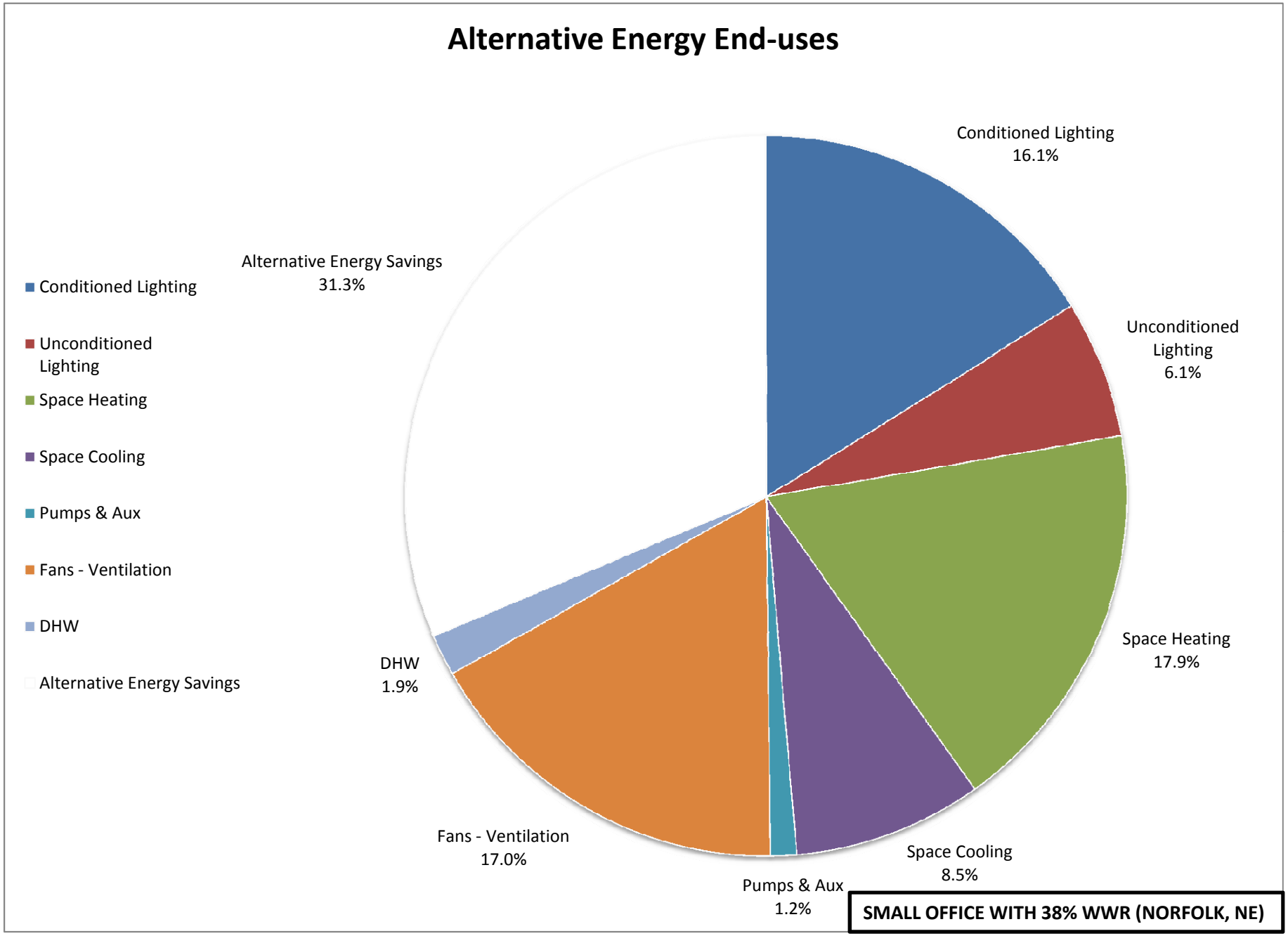
Building Energy Performance Summary - Base Case

End Use	*Energy Source*	*Baseline Building*		*Baseline Building +90*		*Baseline Building +180*		*Baseline Building +270*		*Baseline Average*		*% End Use of Baseline*
		Energy [MMbtu]	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	
Conditioned Lighting	Electricity	96.6	9.0	96.6	9.0	96.6	9.0	96.6	9.0	96.6	9.0	15.2%
Unconditioned Lighting	Electricity	29.4	2.0	29.4	2.0	29.4	2.0	29.4	2.0	29.4	2.0	4.6%
Misc Equipment	Electricity	157.5	14.7	157.5	14.7	157.5	14.7	157.5	14.7	157.5	14.7	24.7%
Space Heating	Electricity									0.0	0.0	0.0%
Space Heating	Gas	193.6	8.0	196.5	8.0	194.1	8.0	196.5	8.0	195.2	8.0	30.7%
Space Heating	Steam/ HW									0.0	0.0	0.0%
Space Cooling	Electricity	62.3	26.3	64.6	27.0	60.8	25.9	64.8	26.8	63.1	26.5	9.9%
Space Cooling	CHW									0.0	0.0	0.0%
Heat Rejection	Electricity									0.0	0.0	0.0%
Pumps & Aux	Electricity	3.7	0.3	3.7	0.3	3.7	0.3	3.7	0.3	3.7	0.3	0.6%
Fans - Ventilation	Electricity	79.8	7.6	83.8	8.0	80.1	7.6	83.7	8.0	81.9	7.8	12.9%
Fans - Exhaust	Electricity									0.0	0.0	0.0%
Refrigeration	Electricity									0.0	0.0	0.0%
HP Supplement	Electricity									0.0	0.0	0.0%
DHW	Elec									0.0	0.0	0.0%
DHW	Gas	9.1	0.0	9.1	0.0	9.1	0.0	9.1	0.0	9.1	0.0	1.4%
Total w/o Misc Equipment		474.5		483.7		473.8		483.8		478.95		
Total w/ Misc Equipment		632.0		641.2		631.3		641.3		636.45		

Energy Cost Summary

Energy Source	*Baseline Cost*	*Baseline Cost +90*	*Baseline Cost +180*	*Baseline Cost +270*	**Baseline Average**
Electricity*	$5,557	$5,688	$5,532	$5,691	**$5,617**
Gas	$1,878	$1,902	$1,882	$1,902	**$1,891**
Steam/ HW					**$0**
Chilled Water					**$0**
Total	**$7,435**	**$7,590**	**$7,414**	**$7,593**	**$7,508**

*Electricity cost excludes Misc Equipment electrical consumption cost (based upon virtual rate)
DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms


Alternative Energy End-uses
Conditioned Lighting
Unconditioned Lighting
Space Heating
Space Cooling
Pumps & Aux
Fans - Ventilation
DHW
Alternative Energy Savings
Alternative Energy Savings
31.3%
Conditioned Lighting
16.1%
Unconditioned Lighting
6.1%
Space Heating
17.9%
Space Cooling
8.5%
Pumps & Aux
1.2%
Fans - Ventilation
17.0%
DHW
1.9%
SMALL OFFICE WITH 38% WWR (NORFOLK, NE)

Small Office 38% Glass Energy Results Summary
Norfolk, NE

Description: 3.42: 3.30 + 3.02 + 3.00 + 2.10 + 1.51 (with Solarban 80 Fenestration replacing Solarban 70XL)
Split System w/ dedicated ERV; 90% eff. furnace; CEE Tier 1; Reduced LPD; Improved wall, R-40 roof, Solarban 80 w/ thermally broken frame

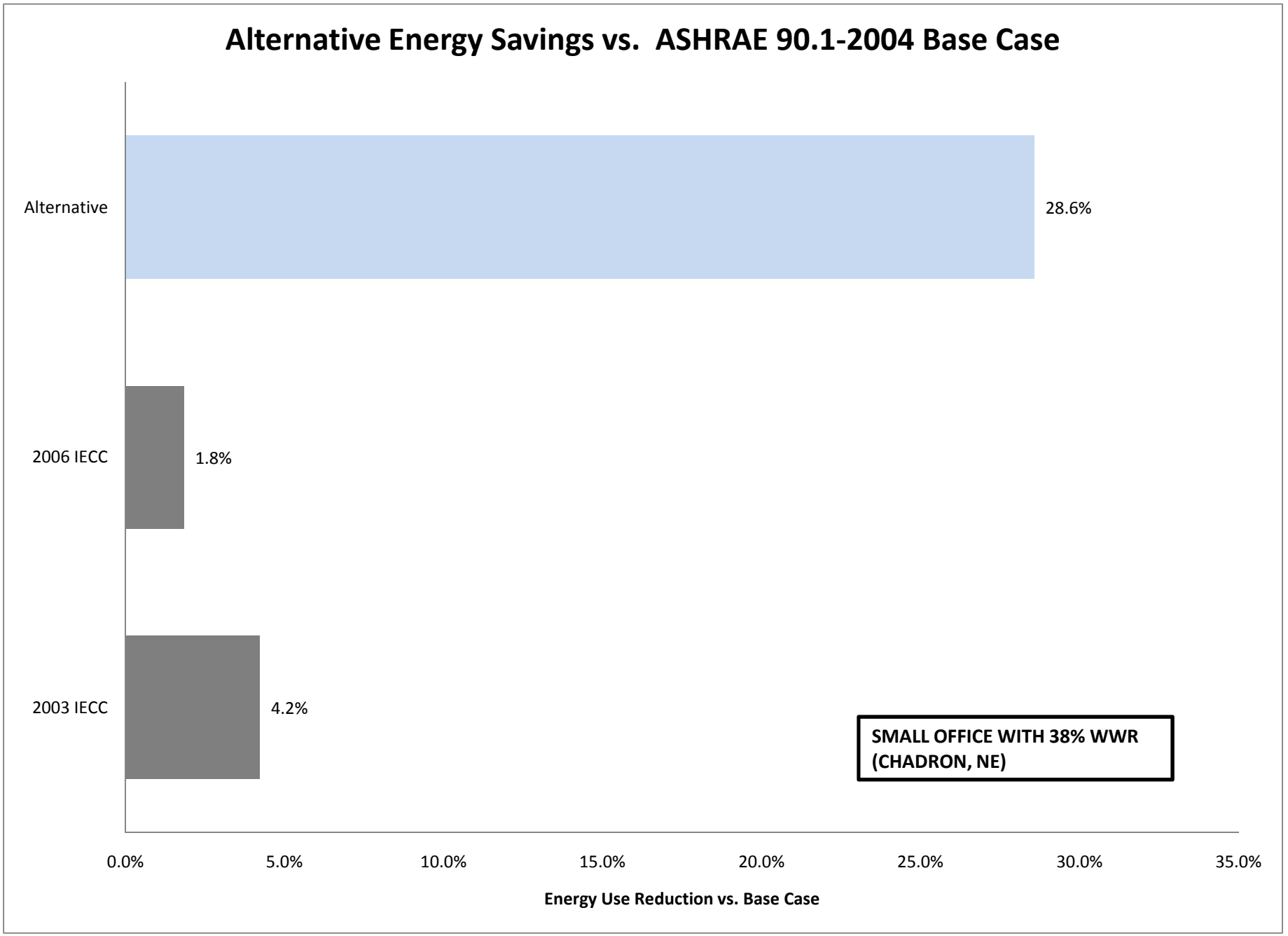
Building Energy Performance Summary - Alternative

End Use	*Energy Source*	*Alternative Building*		*Average Baseline*		*Energy Difference Alt-Baseline*	*% of End Use of As Designed*	*Baseline Consumption Average*
		Energy [MMBtu]	*Peak [kW or therm/hr]*	*Energy [MMBtu]*	*Peak [kW or therm/hr]*	*[%]*	*[%]*	*[%]*
Conditioned Lighting	Electricity	77.3	7.2	96.6	9.0	20.0%	23.5%	20.2%
Unconditioned Lighting	Electricity	29.4	2.0	29.4	2.0	0.0%	8.9%	6.1%
Misc Equipment	Electricity	157.5	14.7	157.5	14.7	0.0%	47.9%	32.9%
Space Heating	Electricity			0.0	0.0		0.0%	0.0%
Space Heating	Gas	85.6	4.0	195.2	8.0	56.1%	26.0%	40.8%
Space Heating	Steam/ HW			0.0	0.0		0.0%	0.0%
Space Cooling	Elec	40.6	16.0	63.1	26.5	35.7%	12.3%	13.2%
Space Cooling	Chilled Water			0.0	0.0		0.0%	0.0%
Heat Rejection	Electricity			0.0	0.0		0.0%	0.0%
Pumps & Aux	Electricity	5.6	0.3	3.7	0.3	-51.4%	1.7%	0.8%
Fans - Ventilation	Electricity	81.4	7.0	81.9	7.8	0.5%	24.7%	17.1%
Fans - Exhaust	Electricity			0.0	0.0		0.0%	0.0%
Refrigeration	Electricity			0.0	0.0		0.0%	0.0%
HP Supplement	Electricity			0.0	0.0		0.0%	0.0%
DHW	Elec			0.0	0.0		0.0%	0.0%
DHW	Gas	9.0	0.0	9.1	0.0	1.1%	2.7%	1.9%
Total w/o Misc Equipment		**328.9**		**479.0**		**31.3%**	100.0%	100.0%
Alternative Energy Savings		**150.1**						
Total w/ Misc Equipment		486.4		636.5		23.6%		

Energy Cost Summary

Energy Source	*As Designed Cost*	*Baseline Cost*
Electricity*	$4,778	$5,617
Gas	$985	$1,891
Steam/ HW		$0
Chilled Water		$0
Total	**$5,763**	**$7,508**

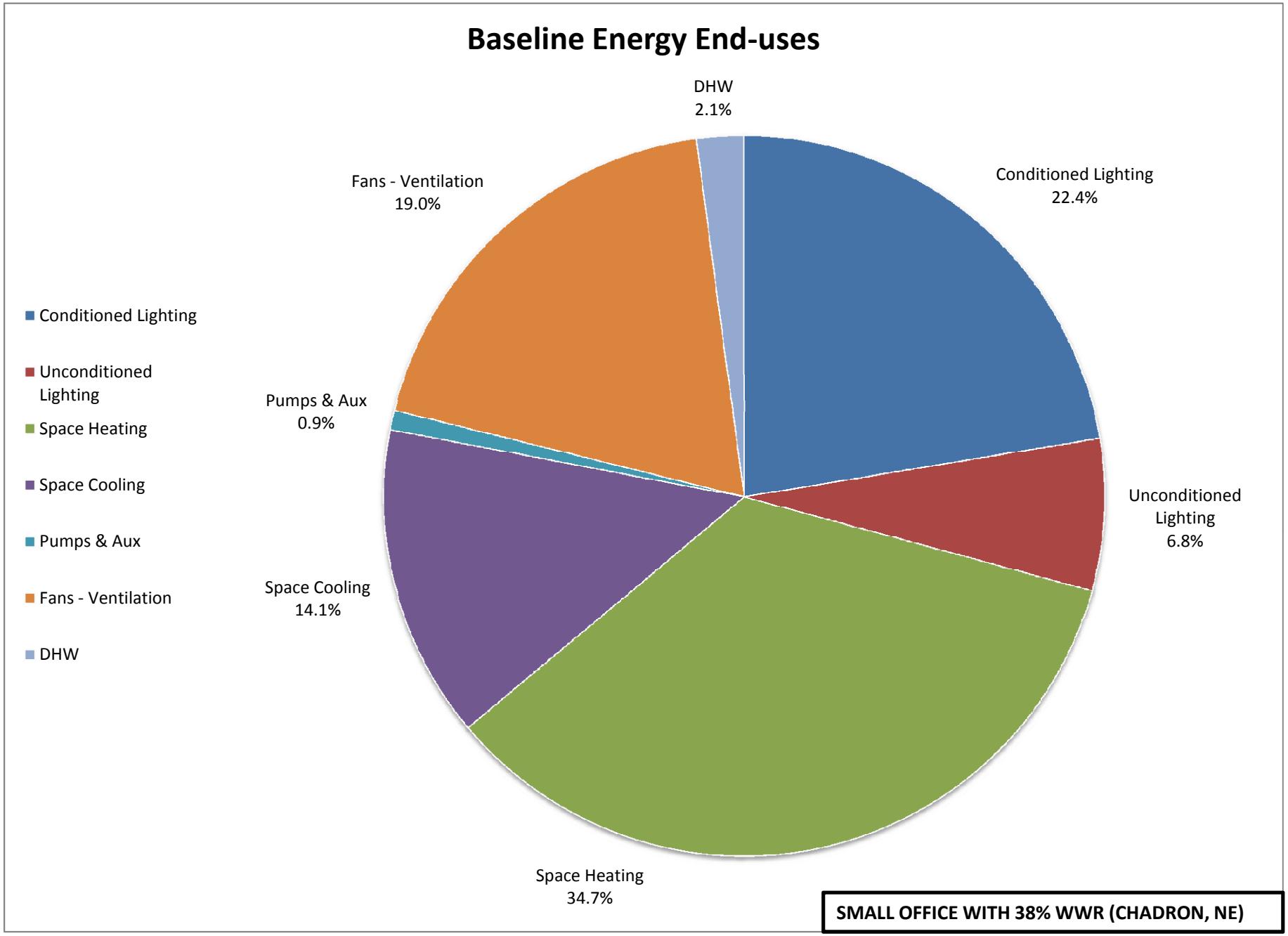
*Electricity cost excludes Misc Equipment electrical consumption cost (based upon virtual rate)
DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms


Alternative Energy Savings vs. ASHRAE 90.1-2004 Base Case
Alternative
28.6%
2006 IECC
1.8%
2003 IECC
4.2%
SMALL OFFICE WITH 38% WWR
(CHADRON, NE)
0.0%
5.0%
10.0%
15.0%
20.0%
25.0%
30.0%
35.0%
Energy Use Reduction vs. Base Case

Small Office 38% Glass Energy Results Summary
Chadron, NE

Run	Name	Annual Energy Use [MMBtu]	Annual Energy Cost [$]	Cost Savings vs. Avg. Base [$]	Savings vs Avg. Base [%]	Energy Use Reduction vs. Base* [MMBtu]	Energy Use Reduction vs. Base* [%]	Notes
0.00	Base Case	428	$6,885					
	Base +90°	435.4	$7,029					ASHRAE 90.1-2004 Baseline Appendix G
	Base +180°	425.9	$6,839					Walls: U-0.084; Roof: U-0.063; Floors - U-0.052
	Base +270°	435.6	$7,032					Windows: U-0.57, SHGC-0.39
	Avg Base Case	431.225	$6,946					
1.10	2003 IECC	413	$7,093	-$147	-2.1%	18.2	4.2%	1.10: 2003 IECC (Chadron 15)
1.11	2006 IECC	423.3	$6,917	$29	0.4%	7.9	1.8%	1.11: 2006 IECC
3.42	Alternative	308	$5,413	$1,534	22.1%	123.2	28.6%	Split System w/ dedicated ERV; 90% eff. furnace; CEE Tier 1; Reduced LPD; Improved wall, R-40 roof, Solarban 80 w/ thermally broken frame

*Energy consumption reported excluding Misc Equipment electrical end-use


Baseline Energy End-uses
DHW
2.1%
Conditioned Lighting
22.4%
Fans - Ventilation
19.0%
Pumps & Aux
0.9%
Unconditioned
Lighting
6.8%
Space Cooling
14.1%
Space Heating
34.7%
Conditioned Lighting
Unconditioned
Lighting
Space Heating
Space Cooling
Pumps & Aux
Fans - Ventilation
DHW
SMALL OFFICE WITH 38% WWR (CHADRON, NE)

Small Office 38% Glass Energy Results Summary
Chadron, NE

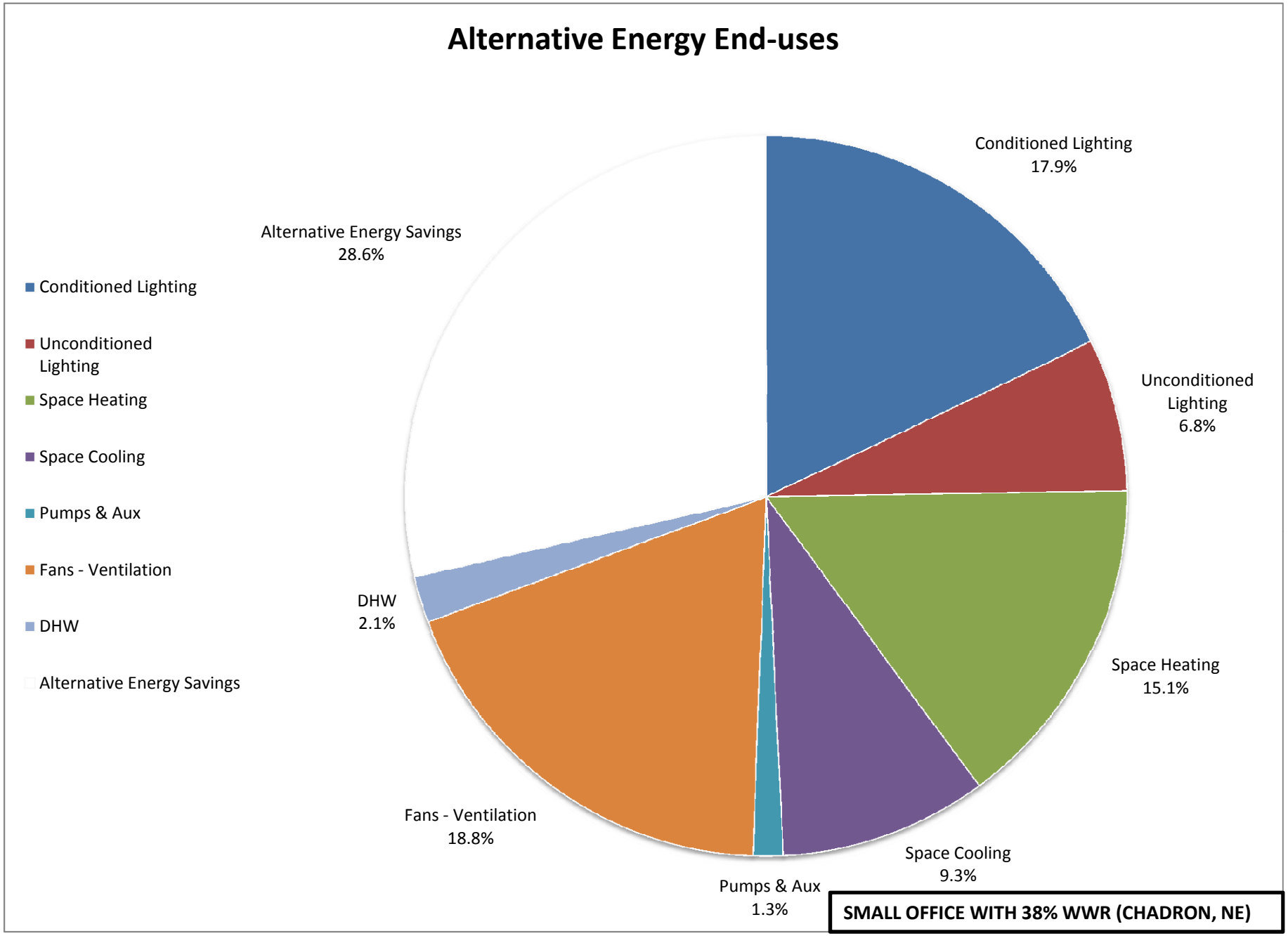
Building Energy Performance Summary - Base Case

End Use	*Energy Source*	*Baseline Building*		*Baseline Building +90*		*Baseline Building +180*		*Baseline Building +270*		*Baseline Average*		*% End Use of Baseline*
		Energy [MMbtu]	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	
Conditioned Lighting	Electricity	96.6	9.0	96.6	9.0	96.6	9.0	96.6	9.0	96.6	9.0	16.4%
Unconditioned Lighting	Electricity	29.4	2.0	29.4	2.0	29.4	2.0	29.4	2.0	29.4	2.0	5.0%
Misc Equipment	Electricity	157.5	14.7	157.5	14.7	157.5	14.7	157.5	14.7	157.5	14.7	26.8%
Space Heating	Electricity									0.0	0.0	0.0%
Space Heating	Gas	149.2	7.0	149.8	7.0	149.1	7.0	149.7	7.0	149.5	7.0	25.4%
Space Heating	Steam/ HW									0.0	0.0	0.0%
Space Cooling	Electricity	60.2	24.3	62.5	25.8	57.9	23.9	62.7	25.6	60.8	24.9	10.3%
Space Cooling	CHW									0.0	0.0	0.0%
Heat Rejection	Electricity									0.0	0.0	0.0%
Pumps & Aux	Electricity	3.8	0.3	3.8	0.3	3.8	0.3	3.8	0.3	3.8	0.3	0.6%
Fans - Ventilation	Electricity	79.7	7.6	84.2	8.0	80.0	7.6	84.3	8.0	82.1	7.8	13.9%
Fans - Exhaust	Electricity									0.0	0.0	0.0%
Refrigeration	Electricity									0.0	0.0	0.0%
HP Supplement	Electricity									0.0	0.0	0.0%
DHW	Elec									0.0	0.0	0.0%
DHW	Gas	9.1	0.0	9.1	0.0	9.1	0.0	9.1	0.0	9.1	0.0	1.5%
Total w/o Misc Equipment		428.0		435.4		425.9		435.6		431.225		
Total w/ Misc Equipment		585.5		592.9		583.4		593.1		588.725		

Energy Cost Summary

Energy Source	*Baseline Cost*	*Baseline Cost +90*	*Baseline Cost +180*	*Baseline Cost +270*	**Baseline Average**
Electricity	$5,514	$5,653	$5,469	$5,657	**$5,573**
Gas	$1,371	$1,376	$1,370	$1,375	**$1,373**
Steam/ HW					**$0**
Chilled Water					**$0**
Total	**$6,885**	**$7,029**	**$6,839**	**$7,032**	**$6,946**

*Electricity cost excludes Misc Equipment electrical consumption cost (based upon virtual rate)
DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms


Alternative Energy End-uses
Conditioned Lighting
Unconditioned Lighting
Space Heating
Space Cooling
Pumps & Aux
Fans - Ventilation
DHW
Alternative Energy Savings
Conditioned Lighting 17.9%
Unconditioned Lighting 6.8%
Space Heating 15.1%
Space Cooling 9.3%
Pumps & Aux 1.3%
Fans - Ventilation 18.8%
DHW 2.1%
Alternative Energy Savings 28.6%
SMALL OFFICE WITH 38% WWR (CHADRON, NE)

Small Office 38% Glass Energy Results Summary
Chadron, NE

Description: 3.42: 3.30 + 3.02 + 3.00 + 2.10 + 1.51 (with Solarban 80 Fenestration replacing Solarban 70XL)
Split System w/ dedicated ERV; 90% eff. furnace; CEE Tier 1; Reduced LPD; Improved wall, R-40 roof, Solarban 80 w/ thermally broken frame

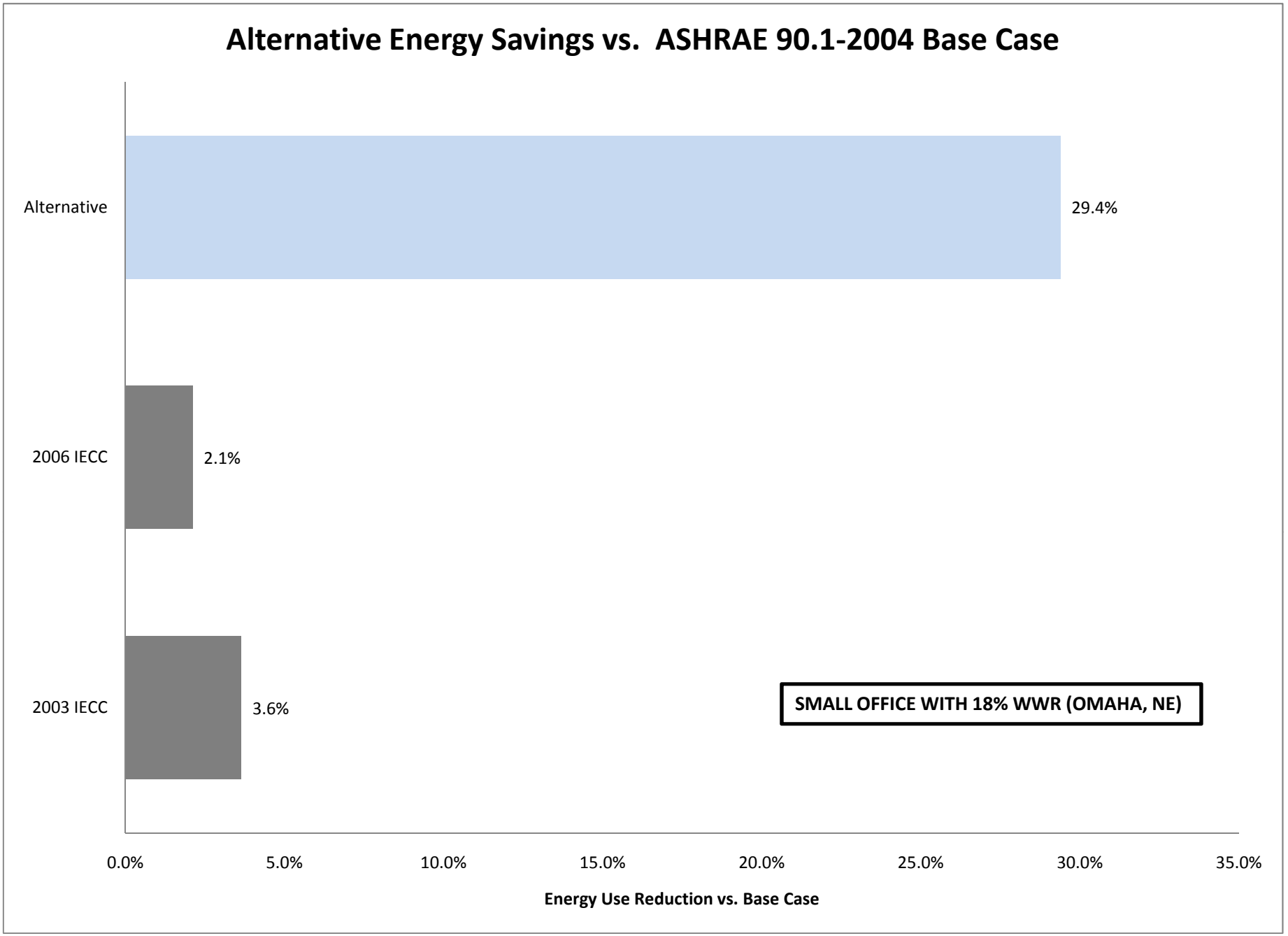
Building Energy Performance Summary - Alternative

End Use	*Energy Source*	*Alternative Building*		*Average Baseline*		*Energy Difference Alt-Baseline*	*% of End Use of As Designed*	*Baseline Consumption Average*
		Energy [MMBtu]	*Peak [kW or therm/hr]*	*Energy [MMBtu]*	*Peak [kW or therm/hr]*	*[%]*	*[%]*	*[%]*
Conditioned Lighting	Electricity	77.3	7.2	96.6	9.0	20.0%	25.1%	22.4%
Unconditioned Lighting	Electricity	29.4	2.0	29.4	2.0	0.0%	9.5%	6.8%
Misc Equipment	Electricity	157.5	14.7	157.5	14.7	0.0%	51.1%	36.5%
Space Heating	Electricity			0.0	0.0		0.0%	0.0%
Space Heating	Gas	65.3	4.0	149.5	7.0	56.3%	21.2%	34.7%
Space Heating	Steam/ HW			0.0	0.0		0.0%	0.0%
Space Cooling	Elec	40.2	15.3	60.8	24.9	33.9%	13.1%	14.1%
Space Cooling	Chilled Water			0.0	0.0		0.0%	0.0%
Heat Rejection	Electricity			0.0	0.0		0.0%	0.0%
Pumps & Aux	Electricity	5.8	0.3	3.8	0.3	-52.6%	1.9%	0.9%
Fans - Ventilation	Electricity	81.0	6.9	82.1	7.8	1.3%	26.3%	19.0%
Fans - Exhaust	Electricity			0.0	0.0		0.0%	0.0%
Refrigeration	Electricity			0.0	0.0		0.0%	0.0%
HP Supplement	Electricity			0.0	0.0		0.0%	0.0%
DHW	Elec			0.0	0.0		0.0%	0.0%
DHW	Gas	9.0	0.0	9.1	0.0	1.1%	2.9%	2.1%
Total w/o Misc Equipment		**308.0**		**431.2**		**28.6%**	100.0%	100.0%
Alternative Energy Savings		**123.2**						
Total w/ Misc Equipment		465.5		588.7		20.9%		

Energy Cost Summary

Energy Source	*As Designed Cost*	*Baseline Cost*
Electricity	$4,769	$5,573
Gas	$644	$1,373
Steam/ HW		$0
Chilled Water		$0
Total	**$5,413**	**$6,946**

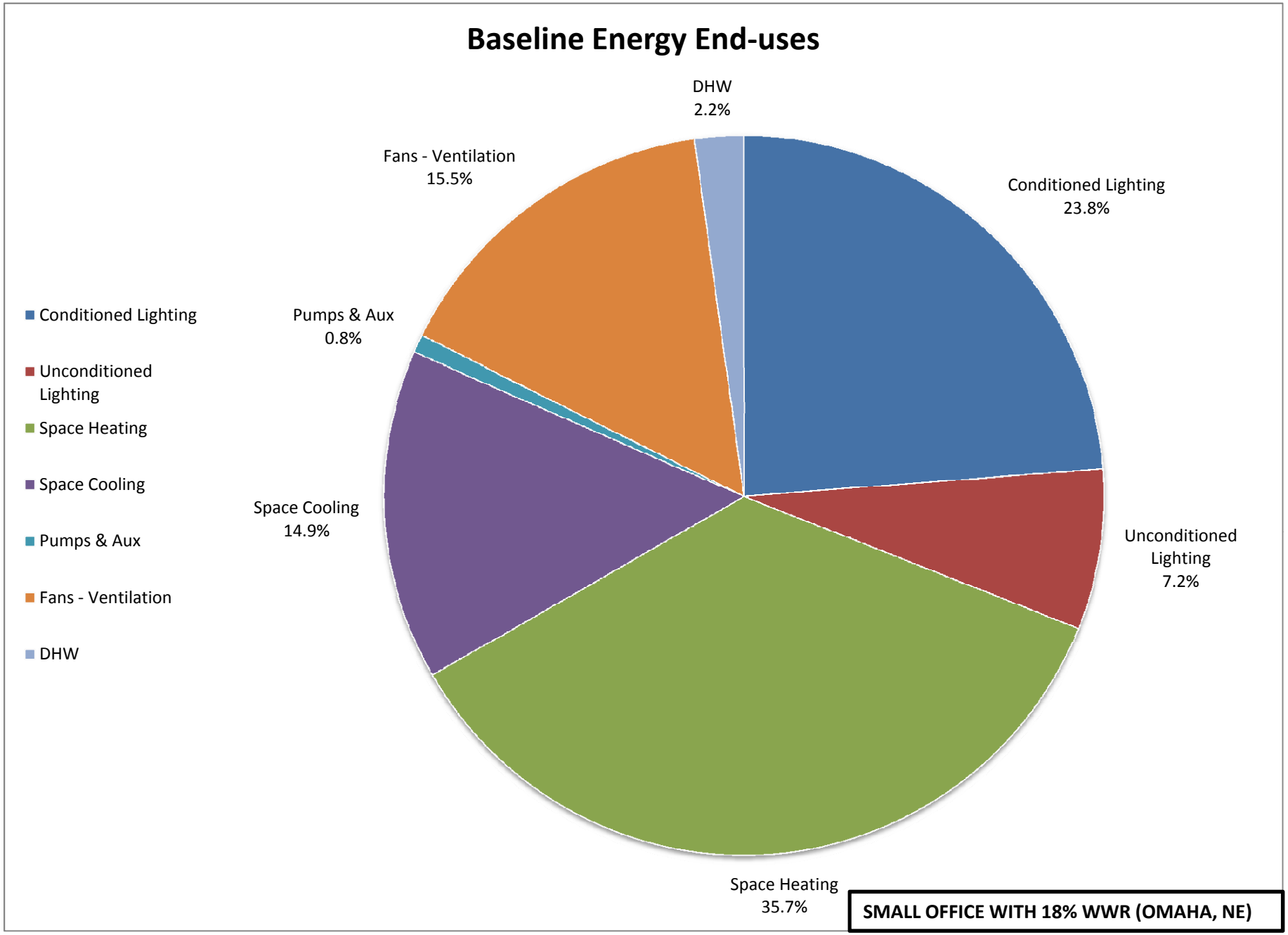
*Electricity cost excludes Misc Equipment electrical consumption cost (based upon virtual rate)
DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms


Alternative Energy Savings vs. ASHRAE 90.1-2004 Base Case
Alternative
29.4%
2006 IECC
2.1%
2003 IECC
3.6%
SMALL OFFICE WITH 18% WWR (OMAHA, NE)
0.0%
5.0%
10.0%
15.0%
20.0%
25.0%
30.0%
35.0%
Energy Use Reduction vs. Base Case

Small Office 18% Glass Energy Results Summary
Omaha, NE

Run	Name	Annual Energy Use* [MMBtu]	Annual Energy Cost* [$]	Cost Savings vs. Avg. Base* [$]	Savings vs Avg. Base* [%]	Energy Use Reduction vs. Base* [MMBtu]	Energy Use Reduction vs. Base* [%]	Notes
0.00	Base Case	403.8	$6,688					
	Base +90°	408.9	$6,771					ASHRAE 90.1-2004 Baseline Appendix G
	Base +180°	403.7	$6,716					Walls: U-0.084; Roof: U-0.063; Floors - U-0.052
	Base +270°	408.9	$6,767					
	Avg Base Case	406.325	$6,735					Windows: U-0.57, SHGC-0.39
1.10	2003 IECC	391.5	$6,645	$90	1.3%	14.82	3.6%	1.10: 2003 IECC (Omaha 13b)
1.11	2006 IECC	397.7	$6,696	$39	0.6%	8.62	2.1%	1.11: 2006 IECC
3.42	Alternative	286.9	$5,198	$1,537	22.8%	119.43	29.4%	Split system w/ dedicated ERV; 90% eff. furnace; CEE Tier 1; Reduced LPD; Improved wall, R-40 roof, and Solarban 70XL w/ thermally broken frame

*Reported excluding Misc Equipment electrical end-use


Baseline Energy End-uses
DHW
2.2%
Fans - Ventilation
15.5%
Conditioned Lighting
23.8%
Pumps & Aux
0.8%
Space Cooling
14.9%
Unconditioned
Lighting
7.2%
Space Heating
35.7%
Conditioned Lighting
Unconditioned
Lighting
Space Heating
Space Cooling
Pumps & Aux
Fans - Ventilation
DHW
SMALL OFFICE WITH 18% WWR (OMAHA, NE)

Small Office 18% Glass Energy Results Summary
Omaha, NE

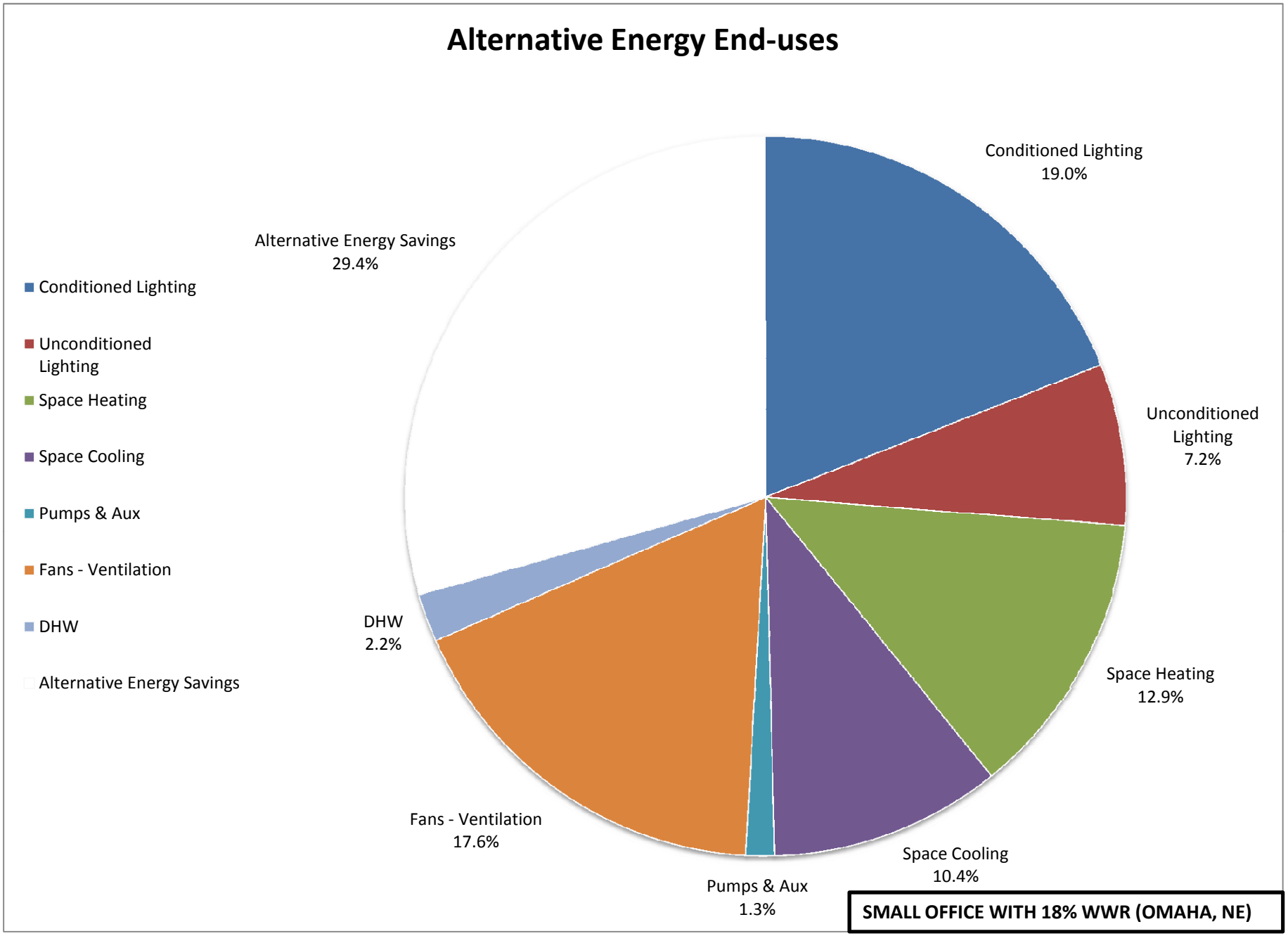
Building Energy Performance Summary - Base Case

End Use	*Energy Source*	*Baseline Building*		*Baseline Building +90*		*Baseline Building +180*		*Baseline Building +270*		Baseline Average		*% End Use of Baseline*
		Energy [MMbtu]	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	
Conditioned Lighting	Electricity	96.6	9.0	96.6	9.0	96.6	9.0	96.6	9.0	96.6	9.0	17.1%
Unconditioned Lighting	Electricity	29.4	2.0	29.4	2.0	29.4	2.0	29.4	2.0	29.4	2.0	5.2%
Misc Equipment	Electricity	157.5	14.7	157.5	14.7	157.5	14.7	157.5	14.7	157.5	14.7	27.9%
Space Heating	Electricity									0.0	0.0	0.0%
Space Heating	Gas	143.9	6.0	145.8	6.0	144.3	6.0	145.7	6.0	144.9	6.0	25.7%
Space Heating	Steam/ HW									0.0	0.0	0.0%
Space Cooling	Electricity	59.8	25.5	61.2	26.0	59.2	25.3	61.3	25.9	60.4	25.7	10.7%
Space Cooling	CHW									0.0	0.0	0.0%
Heat Rejection	Electricity									0.0	0.0	0.0%
Pumps & Aux	Electricity	3.3	0.3	3.3	0.3	3.3	0.3	3.3	0.3	3.3	0.3	0.6%
Fans - Ventilation	Electricity	61.9	5.8	63.7	5.9	62.0	5.8	63.7	5.9	62.8	5.9	11.1%
Fans - Exhaust	Electricity									0.0	0.0	0.0%
Refrigeration	Electricity									0.0	0.0	0.0%
HP Supplement	Electricity									0.0	0.0	0.0%
DHW	Elec									0.0	0.0	0.0%
DHW	Gas	8.9	2.0	8.9	2.0	8.9	2.0	8.9	2.0	8.9	2.0	1.6%
Total w/o Misc Equipment		403.8		408.9		403.7		408.9		406.325		
Total w/ Misc Equipment		561.3		566.4		561.2		566.4		563.825		

Energy Cost Summary

Energy Source	*Baseline Cost*	*Baseline Cost +90*	*Baseline Cost +180*	*Baseline Cost +270*	**Baseline Average**
Electricity*	$5,053	$5,118	$5,049	$5,115	**$5,083**
Gas	$1,635	$1,653	$1,667	$1,652	**$1,652**
Steam/ HW					**$0**
Chilled Water					**$0**
Total	**$6,688**	**$6,771**	**$6,716**	**$6,767**	**$6,735**

*Electricity cost excludes Misc Equipment electrical consumption cost (based upon virtual rate)
DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms


Alternative Energy End-uses
Conditioned Lighting
Unconditioned Lighting
Space Heating
Space Cooling
Pumps & Aux
Fans - Ventilation
DHW
Alternative Energy Savings
Conditioned Lighting 19.0%
Unconditioned Lighting 7.2%
Space Heating 12.9%
Space Cooling 10.4%
Pumps & Aux 1.3%
Fans - Ventilation 17.6%
DHW 2.2%
Alternative Energy Savings 29.4%
SMALL OFFICE WITH 18% WWR (OMAHA, NE)

Small Office 18% Glass Energy Results Summary
Omaha, NE

Description: 3.42: 3.30 + 3.02 + 3.00 + 2.10 + 1.51
Split system w/ dedicated ERV; 90% eff. furnace; CEE Tier 1; Reduced LPD; Improved wall, R-40 roof, and Solarban 70XL w/ thermally broken frame

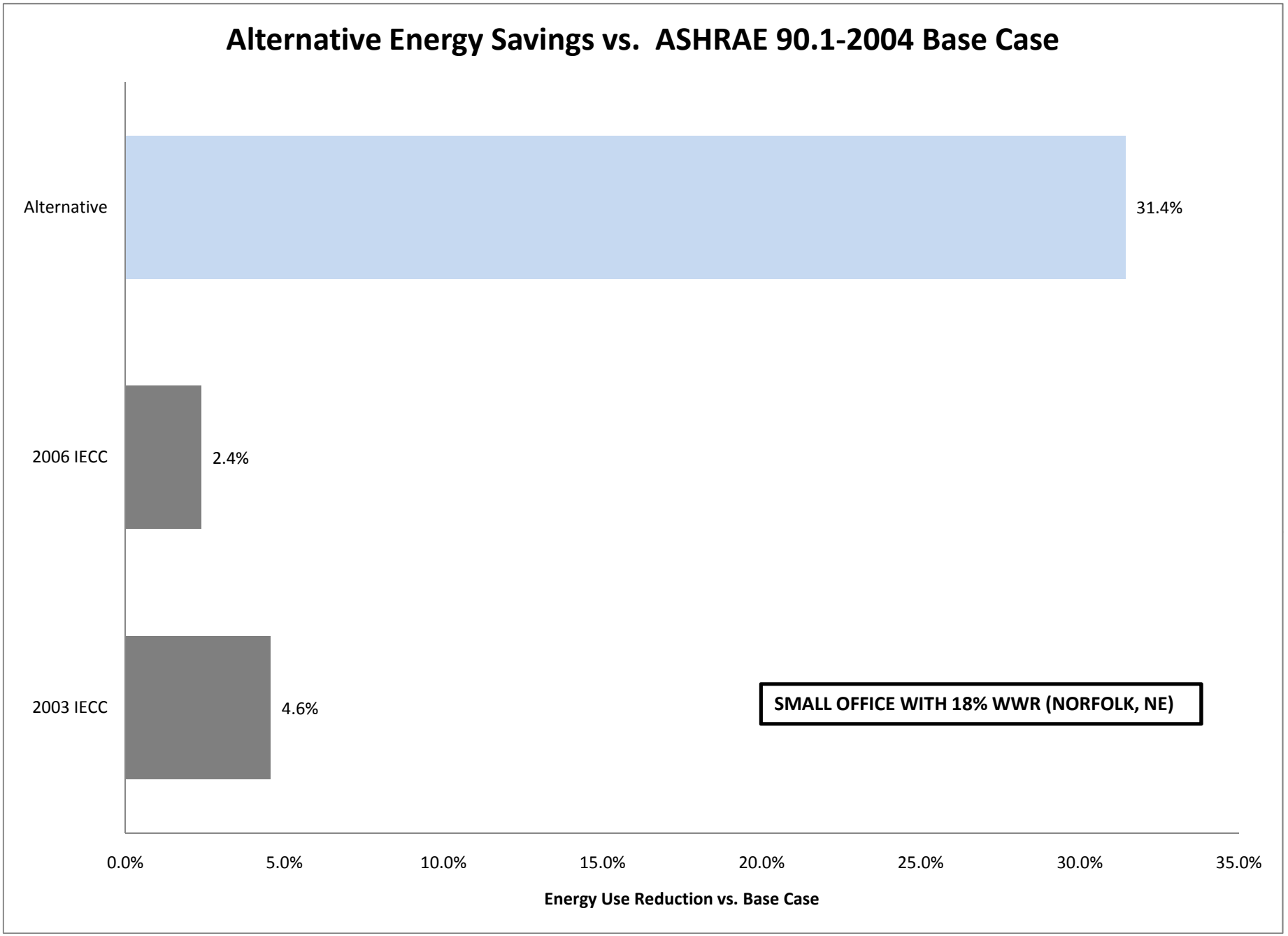
Building Energy Performance Summary

End Use	*Energy Source*	*Alternative Building*		*Average Baseline*		*Energy Difference Alt-Baseline*	*% of End Use of As Designed*	*Baseline Consumption Average*
		Energy [MMBtu]	*Peak [kW or therm/hr]*	*Energy [MMBtu]*	*Peak [kW or therm/hr]*	*[%]*	*[%]*	*[%]*
Conditioned Lighting	Electricity	77.3	7.2	96.6	9.0	20.0%	17.4%	17.1%
Unconditioned Lighting	Electricity	29.4	2.0	29.4	2.0	0.0%	6.6%	5.2%
Misc Equipment	Electricity	157.5	14.7	157.5	14.7	0.0%	35.4%	27.9%
Space Heating	Electricity			0.0	0.0		0.0%	0.0%
Space Heating	Gas	52.5	4.0	144.9	6.0	63.8%	11.8%	25.7%
Space Heating	Steam/ HW			0.0	0.0		0.0%	0.0%
Space Cooling	Elec	42.3	15.0	60.4	25.7	29.9%	9.5%	10.7%
Space Cooling	Chilled Water			0.0	0.0		0.0%	0.0%
Heat Rejection	Electricity			0.0	0.0		0.0%	0.0%
Pumps & Aux	Electricity	5.2	0.0	3.3	0.3	-57.6%	1.2%	0.6%
Fans - Ventilation	Electricity	71.4	6.0	62.8	5.9	-13.6%	16.1%	11.1%
Fans - Exhaust	Electricity			0.0	0.0		0.0%	0.0%
Refrigeration	Electricity			0.0	0.0		0.0%	0.0%
HP Supplement	Electricity			0.0	0.0		0.0%	0.0%
DHW	Elec			0.0	0.0		0.0%	0.0%
DHW	Gas	8.8	2.0	8.9	2.0	1.1%	2.0%	1.6%
Total w/o Misc Equipment		**286.9**		**406.3**		**29.4%**	100.0%	100.0%
Alternative Energy Savings		**119.4**						
Total w/ Misc Equipment		444.4		563.8				

Energy Cost Summary

Energy Source	*As Designed Cost*	*Baseline Cost*
Electricity*	$4,423	$5,083
Gas	$775	$1,652
Steam/ HW		$0
Chilled Water		$0
Total	**$5,198**	**$6,735**

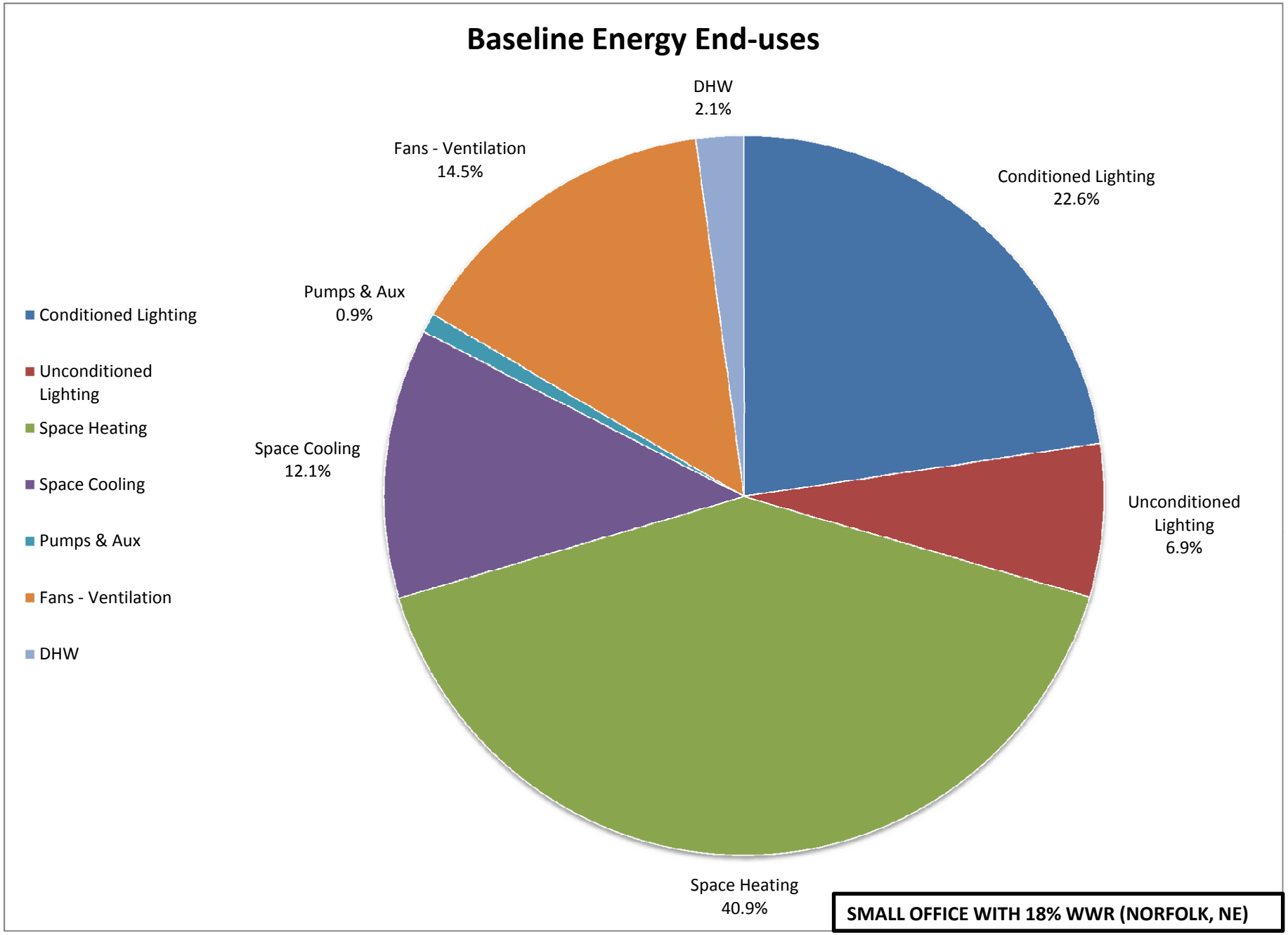
*Electricity cost excludes Misc Equipment electrical consumption cost (based upon virtual rate)
DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms


Alternative Energy Savings vs. ASHRAE 90.1-2004 Base Case
Alternative
31.4%
2006 IECC
2.4%
2003 IECC
4.6%
SMALL OFFICE WITH 18% WWR (NORFOLK, NE)
0.0%
5.0%
10.0%
15.0%
20.0%
25.0%
30.0%
35.0%
Energy Use Reduction vs. Base Case

Small Office 18% Glass Energy Results Summary
Norfolk, NE

Run	Name	Annual Energy Use* [MMBtu]	Annual Energy Cost* [$]	Cost Savings vs. Avg. Base* [$]	Savings vs Avg. Base* [%]	Energy Use Reduction vs. Base* [MMBtu]	Energy Use Reduction vs. Base* [%]	Notes
0.00	Base Case	421.4	$6,670					
	Base +90°	430.4	$6,759					ASHRAE 90.1-2004 Baseline
	Base +180°	424.5	$6,656					Appendix G
	Base +270°	430.5	$6,760					Walls: U-0.084; Roof: U-0.063; Floors - U-0.052
	Avg Base Case	426.7	$6,711					Windows: U-0.57, SHGC-0.39
1.10	2003 IECC	407.2	$6,605	$106	1.6%	19.50	4.6%	1.10: 2003 IECC (Chadron 15)
1.11	2006 IECC	416.5	$6,656	$55	0.8%	10.20	2.4%	1.11: 2006 IECC
3.42	Alternative	292.6	$5,308	$1,403	20.9%	134.10	31.4%	Split system w/ dedicated ERV; 90% eff. furnace; CEE Tier 1; Reduced LPD; Improved wall, R-40 roof, and Solarban 70XL w/ thermally broken frame

*Reported excluding Misc Equipment electrical end-use


Baseline Energy End-uses
DHW
2.1%
Fans - Ventilation
14.5%
Conditioned Lighting
22.6%
Pumps & Aux
0.9%
Space Cooling
12.1%
Unconditioned
Lighting
6.9%
Space Heating
40.9%
Conditioned Lighting
Unconditioned
Lighting
Space Heating
Space Cooling
Pumps & Aux
Fans - Ventilation
DHW
SMALL OFFICE WITH 18% WWR (NORFOLK, NE)

Small Office 18% Glass Energy Results Summary
Norfolk, NE

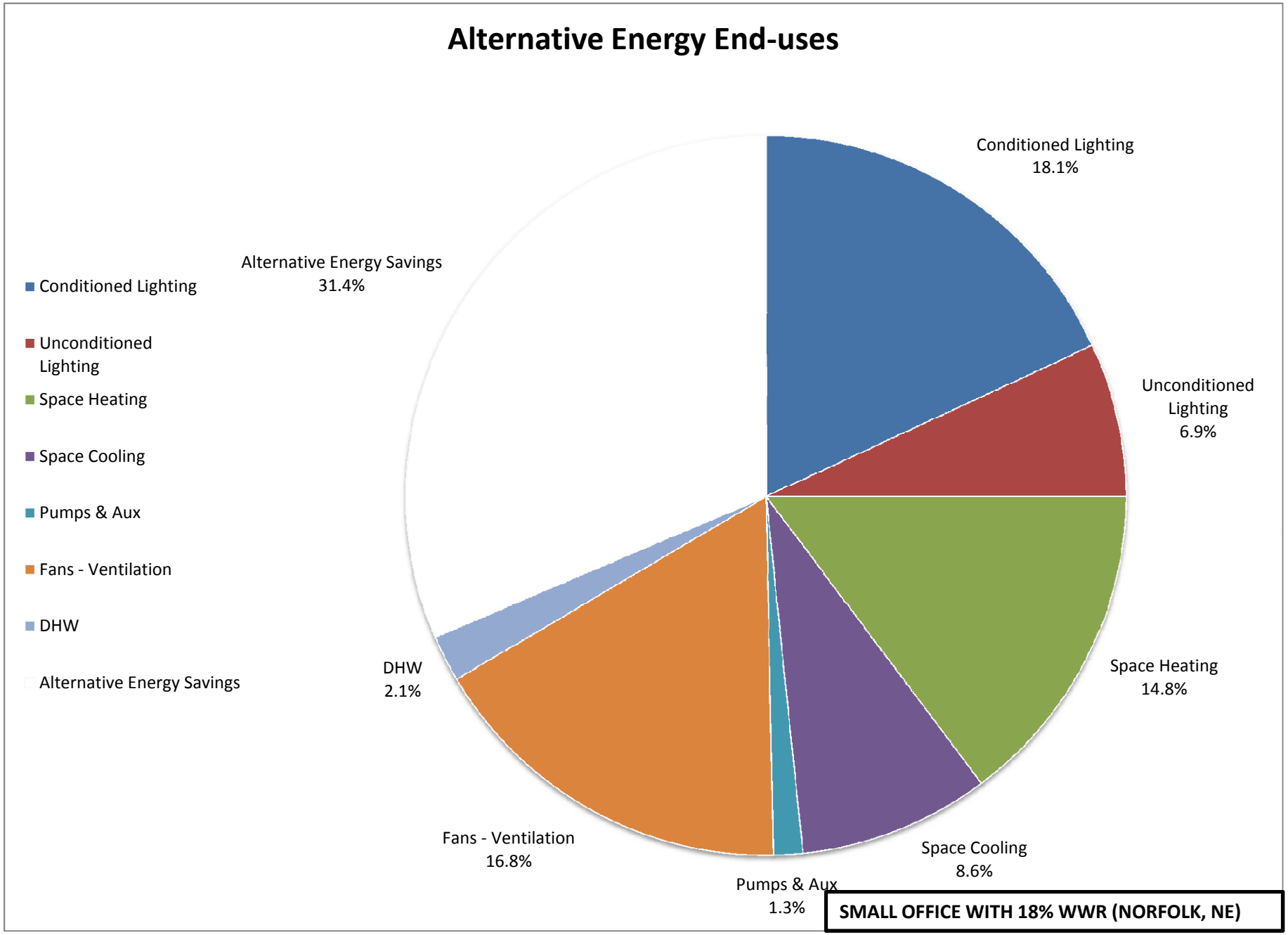
Building Energy Performance Summary - Base Case

End Use	*Energy Source*	*Baseline Building*		*Baseline Building +90*		*Baseline Building +180*		*Baseline Building +270*		Baseline Average		*% End Use of Baseline*
		Energy [MMbtu]	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	
Conditioned Lighting	Electricity	96.6	9.0	96.6	9.0	96.6	9.0	96.6	9.0	96.6	9.0	16.5%
Unconditioned Lighting	Electricity	29.4	2.0	29.4	2.0	29.4	2.0	29.4	2.0	29.4	2.0	5.0%
Misc Equipment	Electricity	157.5	14.7	157.5	14.7	157.5	14.7	157.5	14.7	157.5	14.7	27.0%
Space Heating	Electricity									0.0	0.0	0.0%
Space Heating	Gas	170.9	7.0	176.2	7.0	174.6	7.0	176.2	7.0	174.5	7.0	29.9%
Space Heating	Steam/ HW									0.0	0.0	0.0%
Space Cooling	Electricity	51.0	22.4	52.6	22.8	50.3	22.1	52.7	22.8	51.7	22.5	8.8%
Space Cooling	CHW									0.0	0.0	0.0%
Heat Rejection	Electricity									0.0	0.0	0.0%
Pumps & Aux	Electricity	3.7	0.3	3.7	0.3	3.7	0.3	3.7	0.3	3.7	0.3	0.6%
Fans - Ventilation	Electricity	60.7	5.8	62.8	6.0	60.8	5.8	62.8	6.0	61.8	5.9	10.6%
Fans - Exhaust	Electricity									0.0	0.0	0.0%
Refrigeration	Electricity									0.0	0.0	0.0%
HP Supplement	Electricity									0.0	0.0	0.0%
DHW	Elec									0.0	0.0	0.0%
DHW	Gas	9.1	0.0	9.1	0.0	9.1	0.0	9.1	0.0	9.1	0.0	1.6%
Total w/o Misc Equipment		421.4		430.4		424.5		430.5		426.7		
Total w/ Misc Equipment		578.9		587.9		582.0		588.0		584.2		

Energy Cost Summary

Energy Source	*Baseline Cost*	*Baseline Cost +90*	*Baseline Cost +180*	*Baseline Cost +270*	**Baseline Average**
Electricity*	$4,980	$5,025	$4,935	$5,026	**$4,991**
Gas	$1,690	$1,734	$1,721	$1,734	**$1,720**
Steam/ HW					**$0**
Chilled Water					**$0**
Total	**$6,670**	**$6,759**	**$6,656**	**$6,760**	**$6,711**

*Electricity cost excludes Misc Equipment electrical consumption cost (based upon virtual rate)
DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms


Alternative Energy End-uses
Conditioned Lighting
Unconditioned Lighting
Space Heating
Space Cooling
Pumps & Aux
Fans - Ventilation
DHW
Alternative Energy Savings
Alternative Energy Savings
31.4%
Conditioned Lighting
18.1%
Unconditioned Lighting
6.9%
Space Heating
14.8%
Space Cooling
8.6%
Pumps & Aux
1.3%
Fans - Ventilation
16.8%
DHW
2.1%
SMALL OFFICE WITH 18% WWR (NORFOLK, NE)

Small Office 18% Glass Energy Results Summary
Norfolk, NE

Description: 3.42: 3.30 + 3.02 + 3.00 + 2.10 + 1.51
Split system w/ dedicated ERV; 90% eff. furnace; CEE Tier 1; Reduced LPD; Improved wall, R-40 roof, and Solarban 70XL w/ thermally broken frame

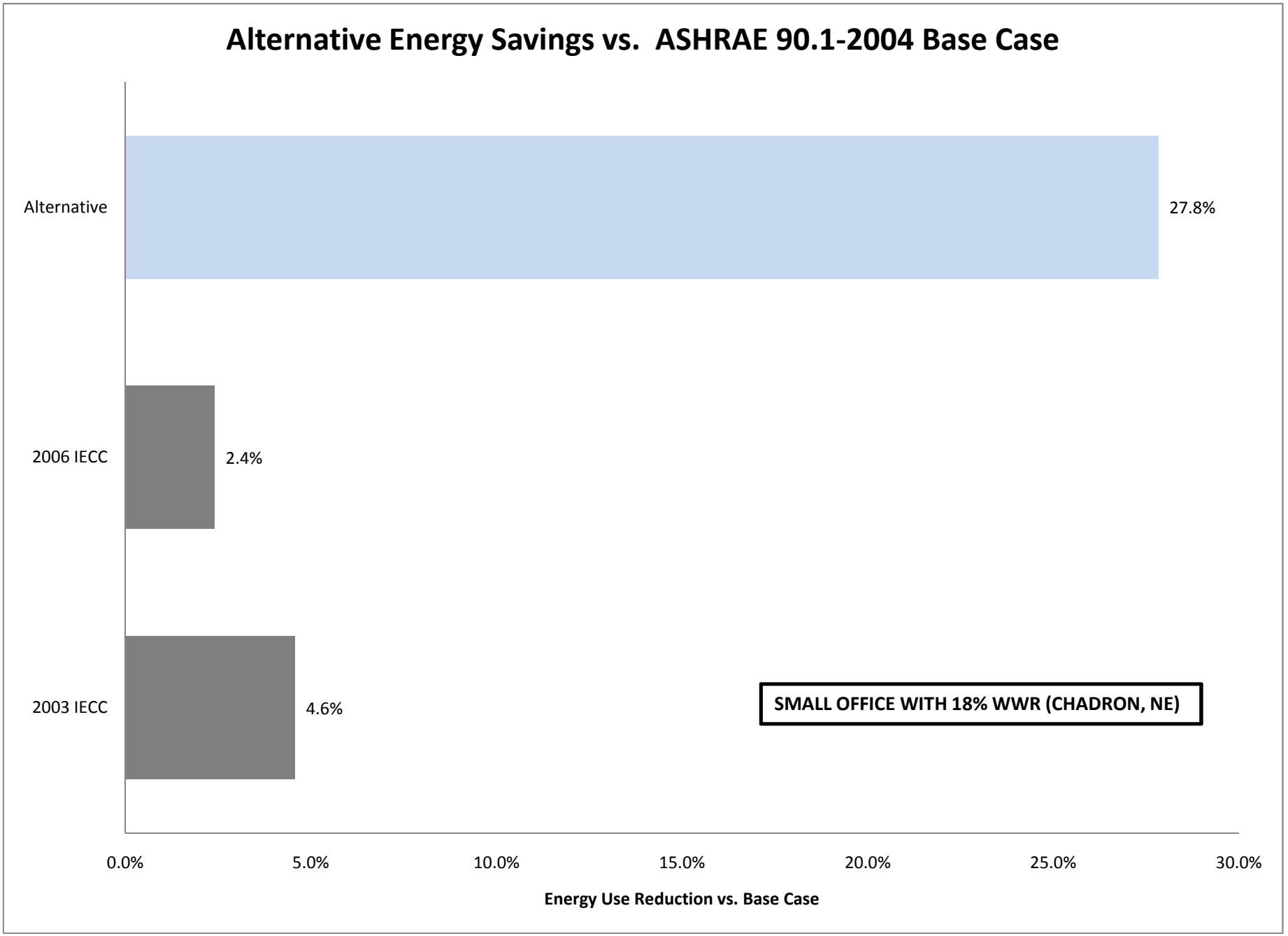
Building Energy Performance Summary

End Use	*Energy Source*	*Alternative Building*		*Average Baseline*		*Energy Difference Alt-Baseline*	*% of End Use of As Designed*	*Baseline Consumption Average*
		Energy [MMBtu]	*Peak [kW or therm/hr]*	*Energy [MMBtu]*	*Peak [kW or therm/hr]*	*[%]*	*[%]*	*[%]*
Conditioned Lighting	Electricity	77.3	7.2	96.6	9.0	20.0%	17.2%	16.5%
Unconditioned Lighting	Electricity	29.4	2.0	29.4	2.0	0.0%	6.5%	5.0%
Misc Equipment	Electricity	157.5	14.7	157.5	14.7	0.0%	35.0%	27.0%
Space Heating	Electricity			0.0	0.0		0.0%	0.0%
Space Heating	Gas	63.0	4.0	174.5	7.0	63.9%	14.0%	29.9%
Space Heating	Steam/ HW			0.0	0.0		0.0%	0.0%
Space Cooling	Elec	36.6	14.0	51.7	22.5	29.1%	8.1%	8.8%
Space Cooling	Chilled Water			0.0	0.0		0.0%	0.0%
Heat Rejection	Electricity			0.0	0.0		0.0%	0.0%
Pumps & Aux	Electricity	5.6	0.3	3.7	0.3	-51.4%	1.2%	0.6%
Fans - Ventilation	Electricity	71.7	5.9	61.8	5.9	-16.1%	15.9%	10.6%
Fans - Exhaust	Electricity			0.0	0.0		0.0%	0.0%
Refrigeration	Electricity			0.0	0.0		0.0%	0.0%
HP Supplement	Electricity			0.0	0.0		0.0%	0.0%
DHW	Elec			0.0	0.0		0.0%	0.0%
DHW	Gas	9.0	0.0	9.1	0.0	1.1%	2.0%	1.6%
Total w/o Misc Equipment		**292.6**		**426.7**		**31.4%**	100.0%	100.0%
Alternative Energy Savings		**134.1**						
Total w/ Misc Equipment		450.1		584.2				

Energy Cost Summary

Energy Source	*As Designed Cost*	*Baseline Cost*
Electricity*	$4,509	$4,991
Gas	$799	$1,720
Steam/ HW		$0
Chilled Water		$0
Total	**$5,308**	**$6,711**

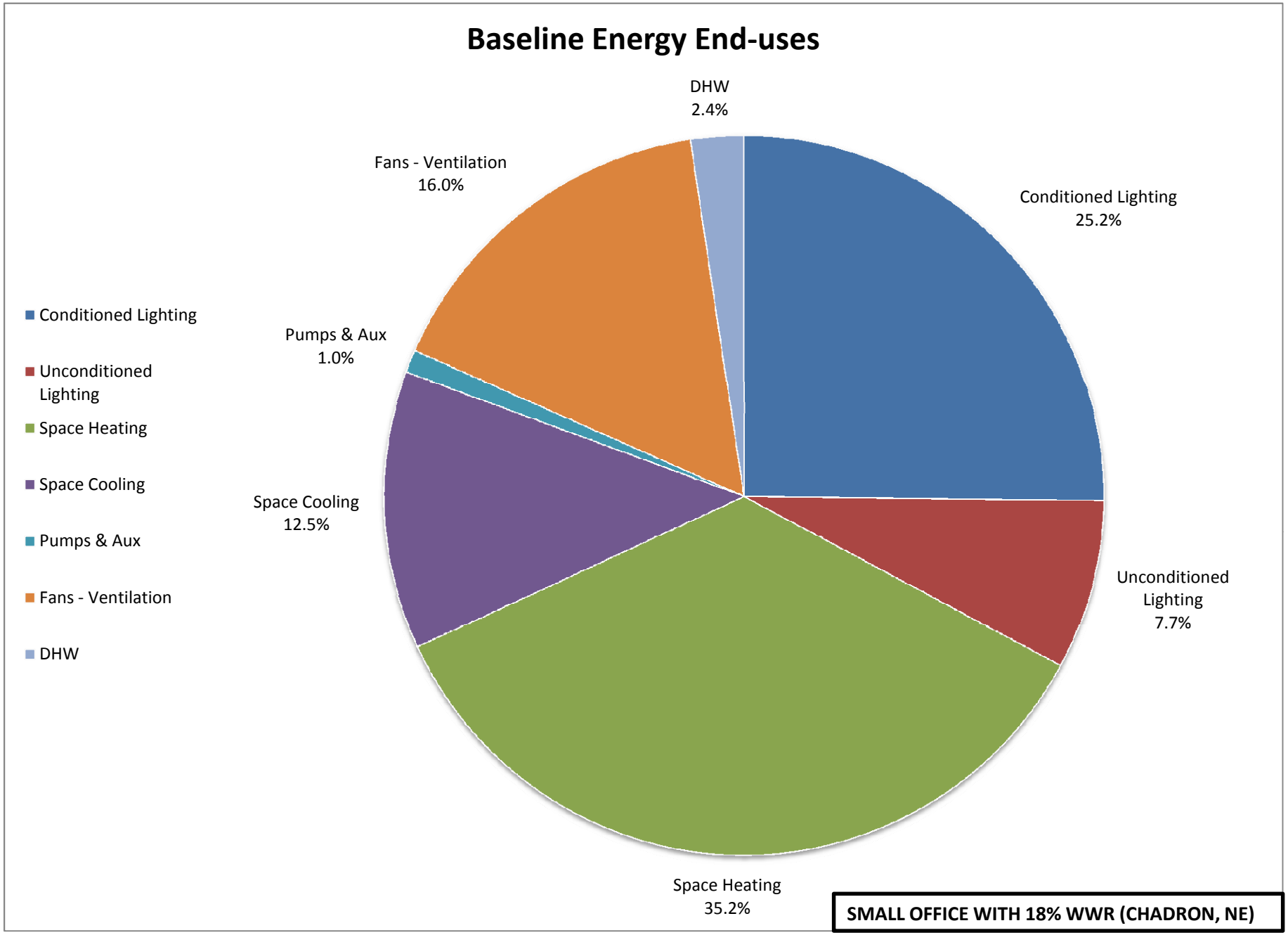
*Electricity cost excludes Misc Equipment electrical consumption cost (based upon virtual rate)
DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms


Alternative Energy Savings vs. ASHRAE 90.1-2004 Base Case
Alternative
27.8%
2006 IECC
2.4%
2003 IECC
4.6%
SMALL OFFICE WITH 18% WWR (CHADRON, NE)
0.0%
5.0%
10.0%
15.0%
20.0%
25.0%
30.0%
Energy Use Reduction vs. Base Case

Small Office 18% Glass Energy Results Summary
Chadron, NE

Run	Name	Annual Energy Use* [MMBtu]	Annual Energy Cost* [$]	Cost Savings vs. Avg. Base* [$]	Savings vs Avg. Base* [%]	Energy Use Reduction vs. Base* [MMBtu]	Energy Use Reduction vs. Base* [%]	Notes
0.00	Base Case	379.8	$6,109					
	Base +90°	387	$6,207					ASHRAE 90.1-2004 Baseline Appendix G
	Base +180°	380.9	$6,097					Walls: U-0.084; Roof: U-0.063; Floors - U-0.052
	Base +270°	386.9	$6,206					
	Avg Base Case	383.65	$6,155					Windows: U-0.57, SHGC-0.39
1.10	2003 IECC	366.1	$6,051	$104	1.7%	17.55	4.6%	1.10: 2003 IECC (Chadron 15)
1.11	2006 IECC	374.4	$6,100	$55	0.9%	9.25	2.4%	1.11: 2006 IECC
3.42	Alternative	276.9	$4,995	$1,160	18.8%	106.75	27.8%	Split system w/ dedicated ERV; 90% eff. furnace; CEE Tier 1; Reduced LPD; Improved wall, R-40 roof, and Solarban 70XL w/ thermally broken frame

*Reported excluding Misc Equipment electrical end-use


Baseline Energy End-uses
DHW
2.4%
Fans - Ventilation
16.0%
Conditioned Lighting
25.2%
Pumps & Aux
1.0%
Space Cooling
12.5%
Unconditioned
Lighting
7.7%
Space Heating
35.2%
Conditioned Lighting
Unconditioned
Lighting
Space Heating
Space Cooling
Pumps & Aux
Fans - Ventilation
DHW
SMALL OFFICE WITH 18% WWR (CHADRON, NE)

Small Office 18% Glass Energy Results Summary
Chadron, NE

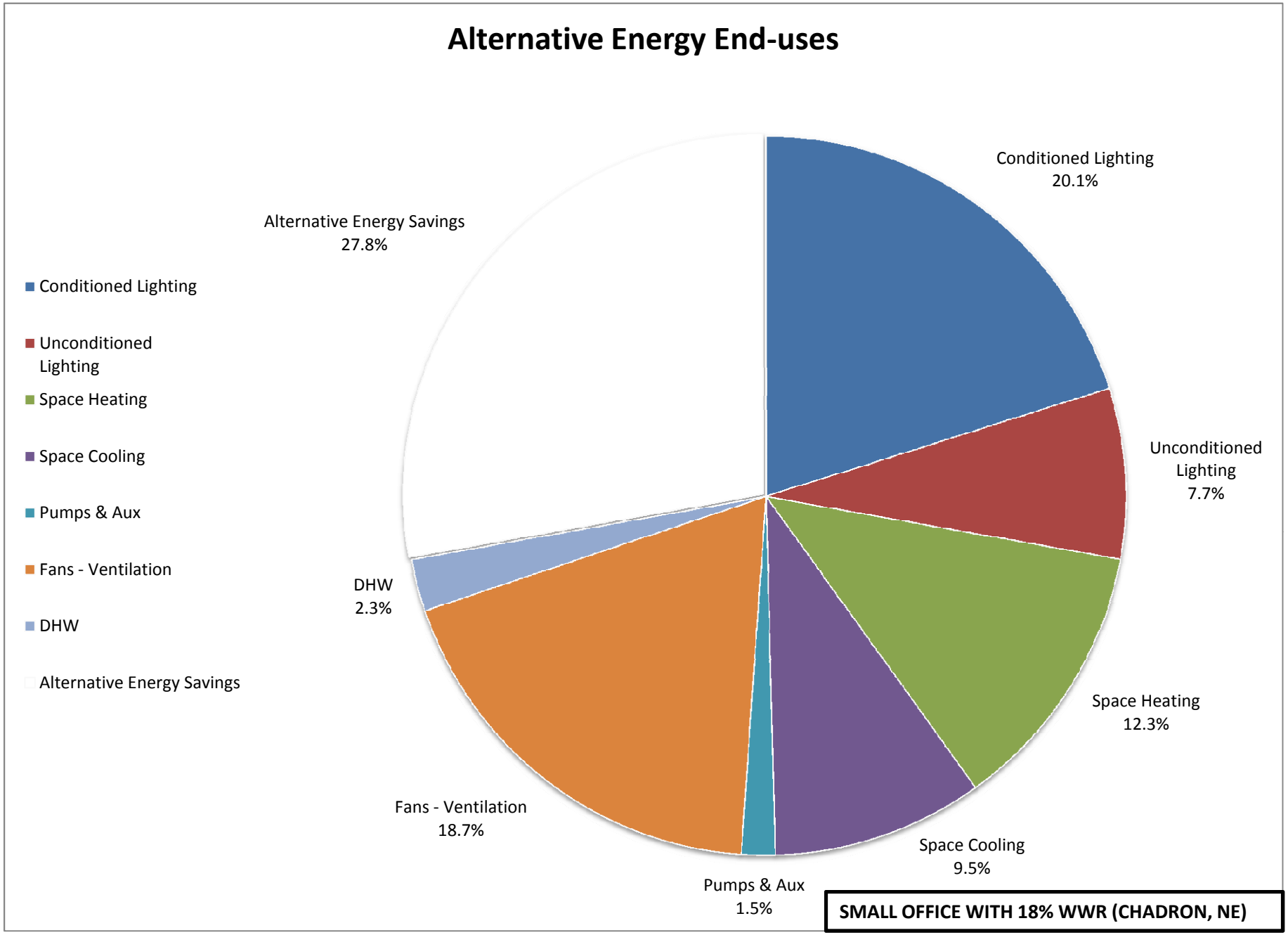
Building Energy Performance Summary - Base Case

End Use	*Energy Source*	*Baseline Building*		*Baseline Building +90*		*Baseline Building +180*		*Baseline Building +270*		Baseline Average		*% End Use of Baseline*
		Energy [MMbtu]	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	
Conditioned Lighting	Electricity	96.6	9.0	96.6	9.0	96.6	9.0	96.6	9.0	96.6	9.0	17.9%
Unconditioned Lighting	Electricity	29.4	2.0	29.4	2.0	29.4	2.0	29.4	2.0	29.4	2.0	5.4%
Misc Equipment	Electricity	157.5	14.7	157.5	14.7	157.5	14.7	157.5	14.7	157.5	14.7	29.1%
Space Heating	Electricity									0.0	0.0	0.0%
Space Heating	Gas	132.5	6.0	136.7	6.0	135.2	6.0	136.5	6.0	135.2	6.0	25.0%
Space Heating	Steam/ HW									0.0	0.0	0.0%
Space Cooling	Electricity	47.1	20.2	49.2	21.0	46.6	20.0	49.2	21.0	48.0	20.6	8.9%
Space Cooling	CHW									0.0	0.0	0.0%
Heat Rejection	Electricity									0.0	0.0	0.0%
Pumps & Aux	Electricity	3.9	0.3	3.9	0.3	3.9	0.3	3.9	0.3	3.9	0.3	0.7%
Fans - Ventilation	Electricity	61.2	5.7	62.1	5.9	60.1	5.7	62.2	5.9	61.4	5.8	11.3%
Fans - Exhaust	Electricity									0.0	0.0	0.0%
Refrigeration	Electricity									0.0	0.0	0.0%
HP Supplement	Electricity									0.0	0.0	0.0%
DHW	Elec									0.0	0.0	0.0%
DHW	Gas	9.1	0.0	9.1	0.0	9.1	0.0	9.1	0.0	9.1	0.0	1.7%
Total w/o Misc Equipment		379.8		387.0		380.9		386.9		383.65		
Total w/ Misc Equipment		537.3		544.5		538.4		544.4		541.15		

Energy Cost Summary

Energy Source	*Baseline Cost*	*Baseline Cost +90*	*Baseline Cost +180*	*Baseline Cost +270*	**Baseline Average**
Electricity*	$4,882	$4,944	$4,847	$4,945	**$4,905**
Gas	$1,227	$1,263	$1,250	$1,261	**$1,250**
Steam/ HW					**$0**
Chilled Water					**$0**
Total	**$6,109**	**$6,207**	**$6,097**	**$6,206**	**$6,155**

*Electricity cost excludes Misc Equipment electrical consumption cost (based upon virtual rate)
DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms


Alternative Energy End-uses
Conditioned Lighting
Unconditioned Lighting
Space Heating
Space Cooling
Pumps & Aux
Fans - Ventilation
DHW
Alternative Energy Savings
Conditioned Lighting 20.1%
Unconditioned Lighting 7.7%
Space Heating 12.3%
Space Cooling 9.5%
Pumps & Aux 1.5%
Fans - Ventilation 18.7%
DHW 2.3%
Alternative Energy Savings 27.8%
SMALL OFFICE WITH 18% WWR (CHADRON, NE)

Small Office 18% Glass Energy Results Summary
Chadron, NE

Description: 3.42: 3.30 + 3.02 + 3.00 + 2.10 + 1.51
Split system w/ dedicated ERV; 90% eff. furnace; CEE Tier 1; Reduced LPD; Improved wall, R-40 roof, and Solarban 70XL w/ thermally broken frame

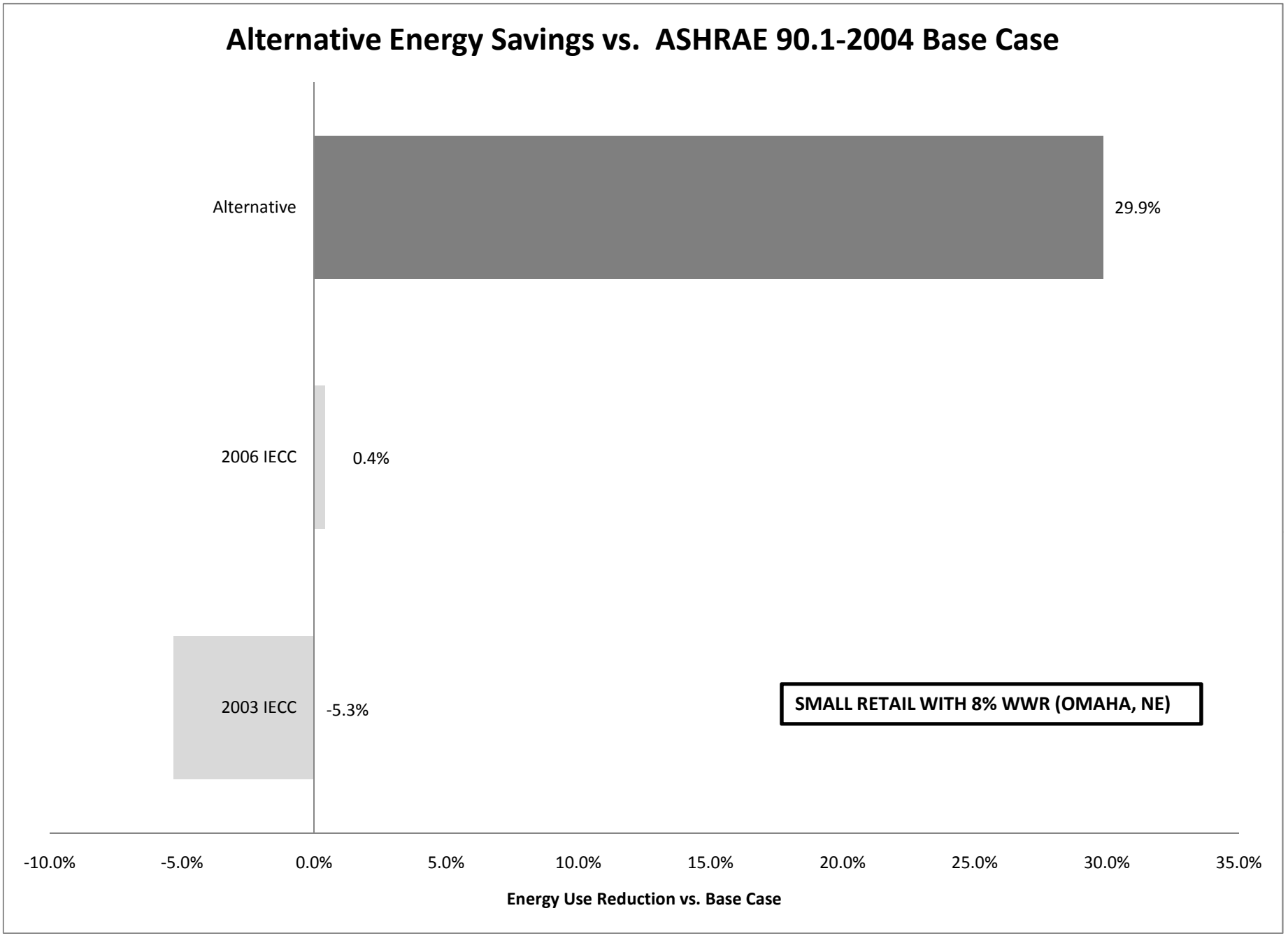
Building Energy Performance Summary

End Use	*Energy Source*	*Alternative Building*		*Average Baseline*		*Energy Difference Alt-Baseline*	*% of End Use of As Designed*	*Baseline Consumption Average*
		Energy [MMBtu]	*Peak [kW or therm/hr]*	*Energy [MMBtu]*	*Peak [kW or therm/hr]*	*[%]*	*[%]*	*[%]*
Conditioned Lighting	Electricity	77.3	7.2	96.6	9.0	20.0%	17.8%	17.9%
Unconditioned Lighting	Electricity	29.4	2.0	29.4	2.0	0.0%	6.8%	5.4%
Misc Equipment	Electricity	157.5	14.7	157.5	14.7	0.0%	36.3%	29.1%
Space Heating	Electricity			0.0	0.0		0.0%	0.0%
Space Heating	Gas	47.1	4.0	135.2	6.0	65.2%	10.8%	25.0%
Space Heating	Steam/ HW			0.0	0.0		0.0%	0.0%
Space Cooling	Elec	36.4	13.4	48.0	20.6	24.2%	8.4%	8.9%
Space Cooling	Chilled Water			0.0	0.0		0.0%	0.0%
Heat Rejection	Electricity			0.0	0.0		0.0%	0.0%
Pumps & Aux	Electricity	5.8	0.3	3.9	0.3	-48.7%	1.3%	0.7%
Fans - Ventilation	Electricity	71.9	6.0	61.4	5.8	-17.1%	16.6%	11.3%
Fans - Exhaust	Electricity			0.0	0.0		0.0%	0.0%
Refrigeration	Electricity			0.0	0.0		0.0%	0.0%
HP Supplement	Electricity			0.0	0.0		0.0%	0.0%
DHW	Elec			0.0	0.0		0.0%	0.0%
DHW	Gas	9.0	0.0	9.1	0.0	1.1%	2.1%	1.7%
Total w/o Misc Equipment		**276.9**		**383.7**		**27.8%**	100.0%	100.0%
Alternative Energy Savings		**106.8**						
Total w/ Misc Equipment		434.4		541.2				

Energy Cost Summary

Energy Source	*As Designed Cost*	*Baseline Cost*
Electricity*	$4,509	$4,905
Gas	$486	$1,250
Steam/ HW		$0
Chilled Water		$0
Total	**$4,995**	**$6,155**

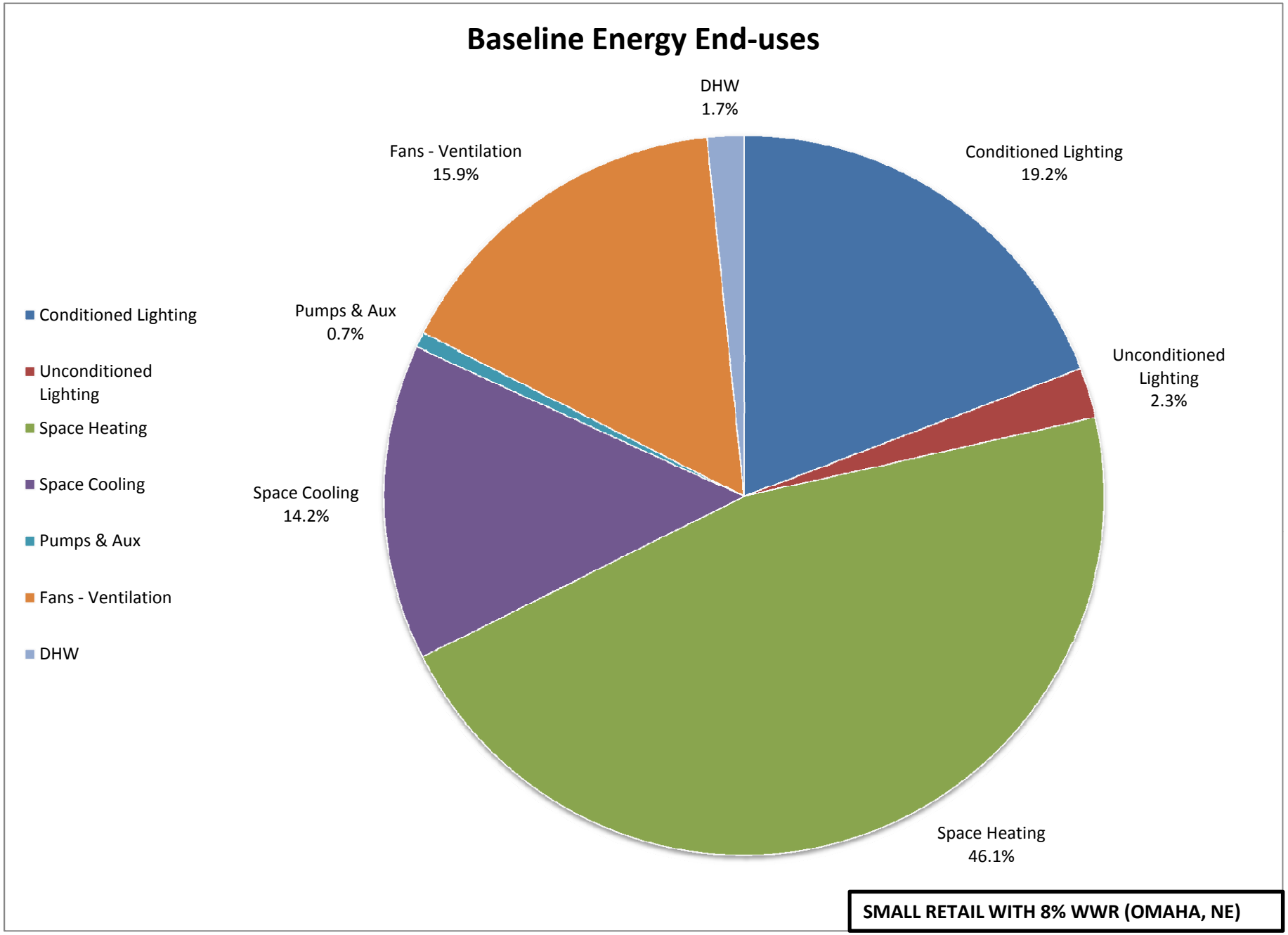
*Electricity cost excludes Misc Equipment electrical consumption cost (based upon virtual rate)
DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms


Alternative Energy Savings vs. ASHRAE 90.1-2004 Base Case
Alternative
29.9%
2006 IECC
0.4%
2003 IECC
-5.3%
SMALL RETAIL WITH 8% WWR (OMAHA, NE)
-10.0%
-5.0%
0.0%
5.0%
10.0%
15.0%
20.0%
25.0%
30.0%
35.0%
Energy Use Reduction vs. Base Case

Small Retail 8% Glass Energy Results Summary
Omaha, NE

Run	Name	Annual Energy Use* [MMBtu]	Annual Energy Cost* [$]	Cost Savings vs. Avg. Base* [$]	Savings vs Avg. Base* [%]	Energy Use Reduction vs. Base* [MMBtu]	Energy Use Reduction vs. Base* [%]	Notes
0.00	Base Case	481.5	$7,042					
	Base +90°	486.9	$7,090					ASHRAE 90.1-2004 Baseline
	Base +180°	481.5	$7,045					Appendix G
	Base +270°	486.8	$7,089					Walls: U-0.084; Roof: U-0.063; Floors - U-0.052
	Avg Base Case	484.175	$7,067					Windows: U-0.57, SHGC-0.39
1.10	2003 IECC	510	$7,385	-$318	-4.5%	-25.83	-5.3%	2003 IECC
1.11	2006 IECC	482.2	$7,023	$43	0.6%	1.98	0.4%	2006 IECC
3.42	As Designed	339.5	$5,350	$1,717	24.3%	144.68	29.9%	Alternative

*Reported excluding Misc Equipment electrical end-use


Baseline Energy End-uses
DHW
1.7%
Fans - Ventilation
15.9%
Conditioned Lighting
19.2%
Pumps & Aux
0.7%
Unconditioned
Lighting
2.3%
Space Cooling
14.2%
Space Heating
46.1%
Conditioned Lighting
Unconditioned
Lighting
Space Heating
Space Cooling
Pumps & Aux
Fans - Ventilation
DHW
SMALL RETAIL WITH 8% WWR (OMAHA, NE)

Small Retail 8% Glass Energy Results Summary
Omaha, NE

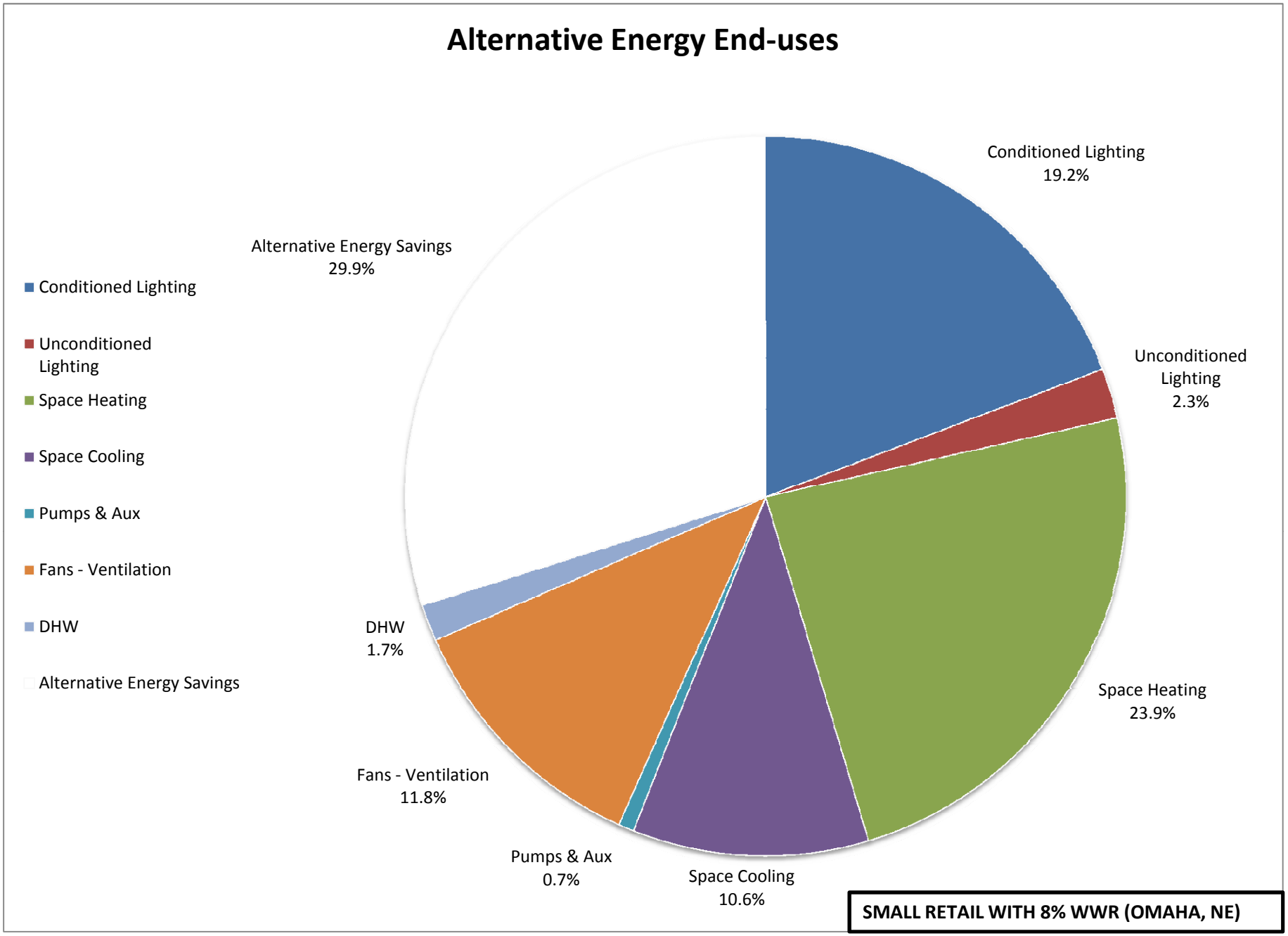
Building Energy Performance Summary - Base Case

End Use	*Energy Source*	*Baseline Building*		*Baseline Building +90*		*Baseline Building +180*		*Baseline Building +270*		Baseline Average		*% End Use of Baseline*
		Energy [MMbtu]	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	
Conditioned Lighting	Electricity	93.1	6.8	93.1	6.8	93.1	6.8	93.1	6.8	93.1	6.8	14.4%
Unconditioned Lighting	Electricity	10.9	0.6	10.9	0.6	10.9	0.6	10.9	0.6	10.9	0.6	1.7%
Misc Equipment	Electricity	161.3	11.7	161.3	11.7	161.3	11.7	161.3	11.7	161.3	11.7	25.0%
Space Heating	Electricity									0.0	0.0	0.0%
Space Heating	Gas	221.9	0.3	224.8	0.3	221.8	0.3	224.7	0.3	223.3	0.3	34.6%
Space Heating	Steam/ HW									0.0	0.0	0.0%
Space Cooling	Electricity	68.4	19.4	69.0	18.9	68.5	19.4	69.0	18.9	68.7	19.2	10.6%
Space Cooling	CHW									0.0	0.0	0.0%
Heat Rejection	Electricity									0.0	0.0	0.0%
Pumps & Aux	Electricity	3.3	0.0	3.3	0.0	3.3	0.0	3.3	0.0	3.3	0.0	0.5%
Fans - Ventilation	Electricity	75.9	3.8	77.8	3.9	75.9	3.8	77.8	3.9	76.9	3.9	11.9%
Fans - Exhaust	Electricity									0.0	0.0	0.0%
Refrigeration	Electricity									0.0	0.0	0.0%
HP Supplement	Electricity									0.0	0.0	0.0%
DHW	Elec									0.0	0.0	0.0%
DHW	Gas	8.0	0.0	8.0	0.0	8.0	0.0	8.0	0.0	8.0	0.0	1.2%
Total w/o Misc Equipment		481.5		486.9		481.5		486.8		484.175		
Total w/ Misc Equipment		642.8		648.2		642.8		648.1		645.475		

Energy Cost Summary

Energy Source	*Baseline Cost*	*Baseline Cost +90*	*Baseline Cost +180*	*Baseline Cost +270*	**Baseline Average**
Electricity*	$4,684	$4,704	$4,688	$4,704	**$4,695**
Gas	$2,358	$2,386	$2,357	$2,385	**$2,372**
Total	**$7,042**	**$7,090**	**$7,045**	**$7,089**	**$7,067**

*Electricity cost excludes Misc Equipment electrical consumption cost (based upon virtual rate)
DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms


Alternative Energy End-uses
Conditioned Lighting
Unconditioned Lighting
Space Heating
Space Cooling
Pumps & Aux
Fans - Ventilation
DHW
Alternative Energy Savings
Conditioned Lighting 19.2%
Unconditioned Lighting 2.3%
Space Heating 23.9%
Space Cooling 10.6%
Pumps & Aux 0.7%
Fans - Ventilation 11.8%
DHW 1.7%
Alternative Energy Savings 29.9%
SMALL RETAIL WITH 8% WWR (OMAHA, NE)

Small Retail 8% Glass Energy Results Summary
Omaha, NE

Description: Alternative

Split system; 90% eff. furnace; CEE Tier 1; Improved wall, R-40 roof, and Solarban 70XL w/ thermally broken frame

Building Energy Performance Summary

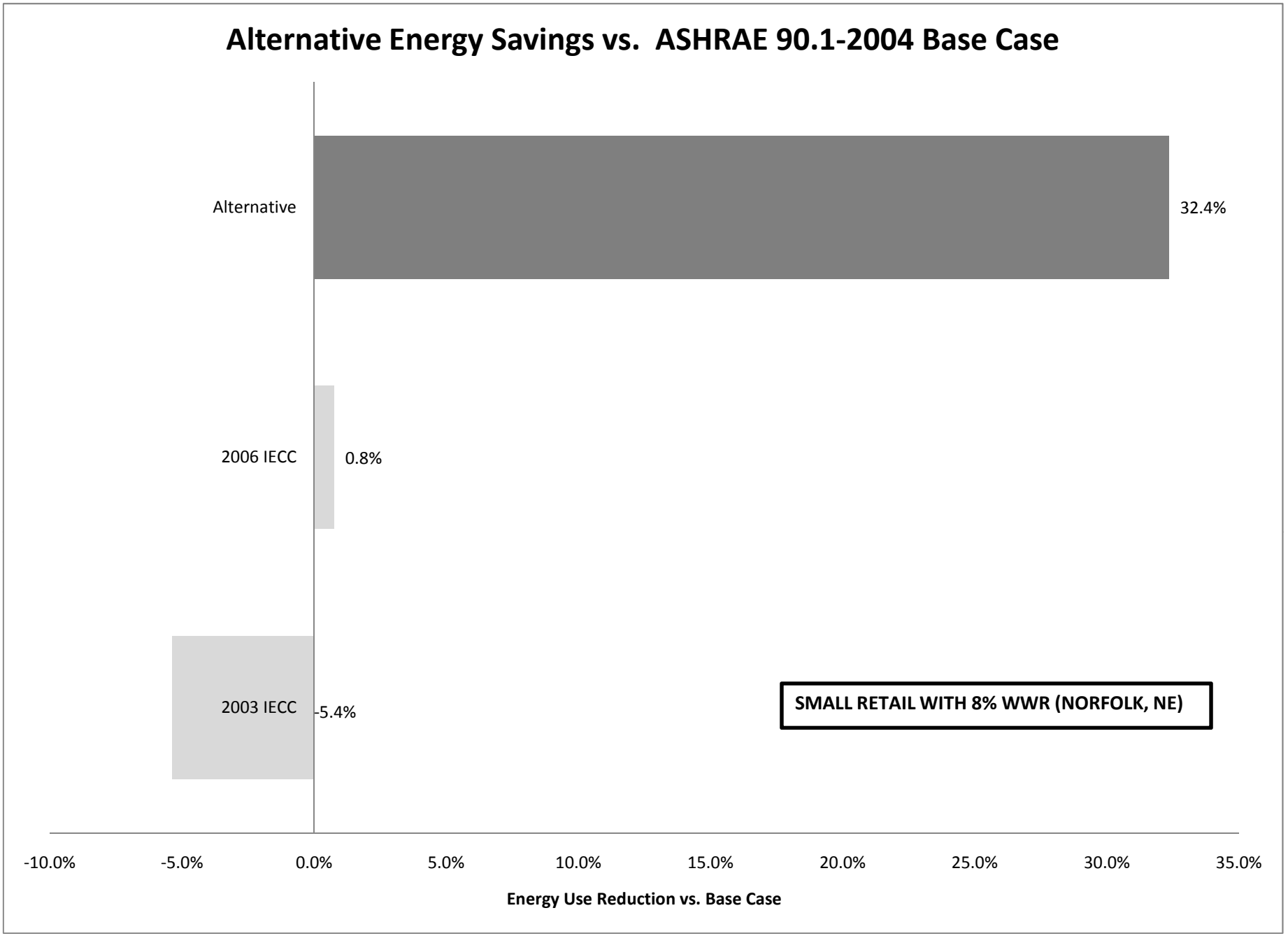
End Use	*Energy Source*	*Alternative Building*		*Average Baseline*		*Energy Difference Alt-Baseline*	*% of End Use of As Designed*	*Baseline Consumption Average*
		Energy [MMBtu]	*Peak [kW or therm/hr]*	*Energy [MMBtu]*	*Peak [kW or therm/hr]*	*[%]*	*[%]*	*[%]*
Conditioned Lighting	Electricity	93.1	6.8	93.1	6.8	0.0%	18.6%	14.4%
Unconditioned Lighting	Electricity	10.9	0.6	10.9	0.6	0.0%	2.2%	1.7%
Misc Equipment	Electricity	161.3	11.7	161.3	11.7	0.0%	32.2%	25.0%
Space Heating	Electricity			0.0	0.0		0.0%	0.0%
Space Heating	Gas	115.7	0.3	223.3	0.3	48.2%	23.1%	34.6%
Space Heating	Steam/ HW			0.0	0.0		0.0%	0.0%
Space Cooling	Elec	51.3	15.2	68.7	19.2	25.4%	10.2%	10.6%
Space Cooling	Chilled Water			0.0	0.0		0.0%	0.0%
Heat Rejection	Electricity			0.0	0.0		0.0%	0.0%
Pumps & Aux	Electricity	3.4	0.0	3.3	0.0	-3.0%	0.7%	0.5%
Fans - Ventilation	Electricity	57.1	3.2	76.9	3.9	25.7%	11.4%	11.9%
Fans - Exhaust	Electricity			0.0	0.0		0.0%	0.0%
Refrigeration	Electricity			0.0	0.0		0.0%	0.0%
HP Supplement	Electricity			0.0	0.0		0.0%	0.0%
DHW	Elec			0.0	0.0		0.0%	0.0%
DHW	Gas	8.0	0.0	8.0	0.0	0.0%	1.6%	1.2%
Total w/o Misc Equipment		**339.5**		**484.2**		**29.9%**	100.0%	100.0%
Alternative Energy Savings		**144.7**						
Total w/ Misc Equipment		500.8		645.5				

Energy Cost Summary

Energy Source	*As Designed Cost*	*Baseline Cost*
Electricity*	$3,992	$4,695
Gas	$1,358	$2,372
Total	$5,350	$7,067

*Electricity cost excludes Misc Equipment electrical consumption cost (based upon virtual rate)

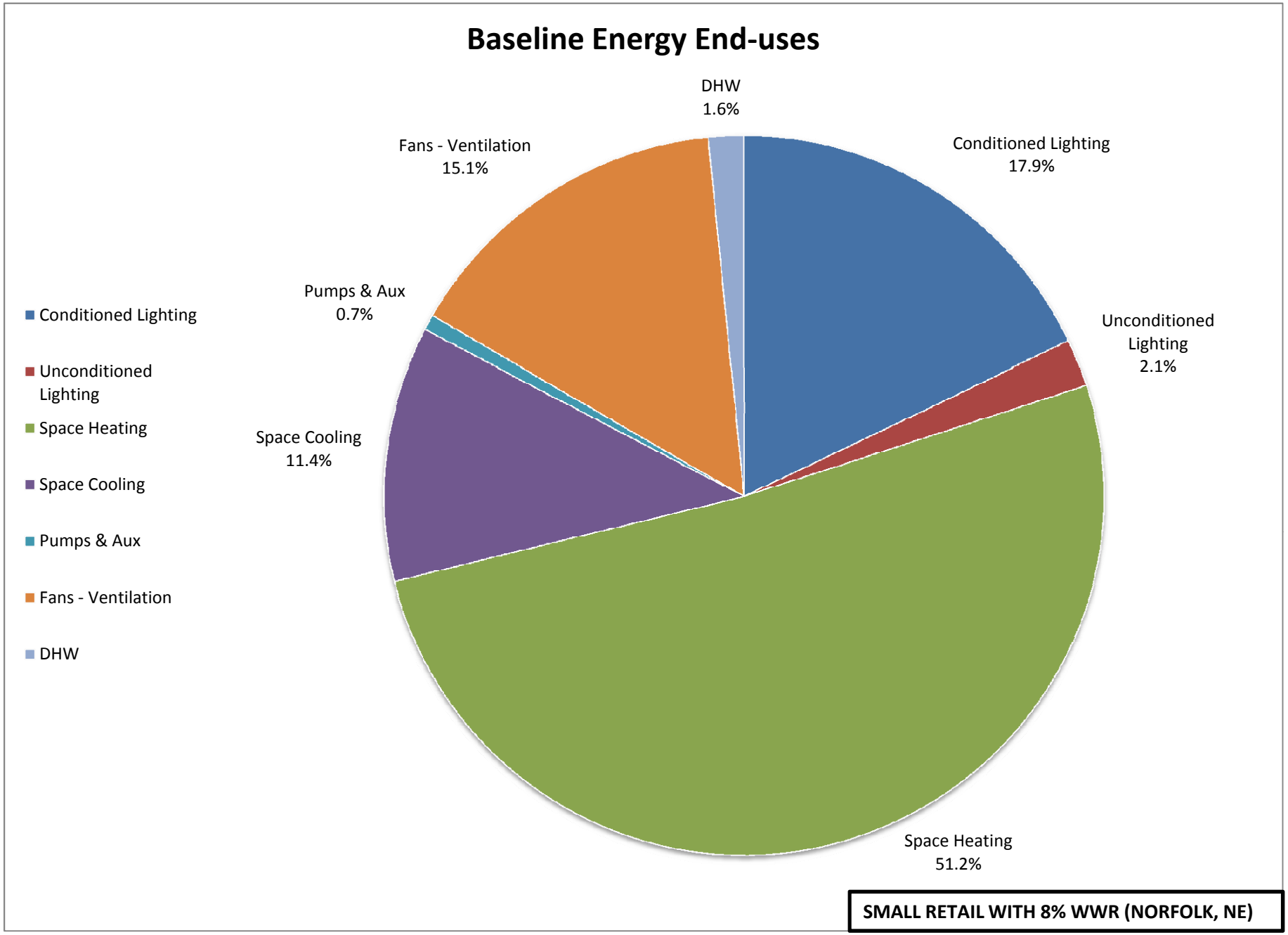
DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms


Alternative Energy Savings vs. ASHRAE 90.1-2004 Base Case
Alternative
32.4%
2006 IECC
0.8%
2003 IECC
-5.4%
SMALL RETAIL WITH 8% WWR (NORFOLK, NE)
-10.0%
-5.0%
0.0%
5.0%
10.0%
15.0%
20.0%
25.0%
30.0%
35.0%
Energy Use Reduction vs. Base Case

Small Retail 8% Glass Energy Results Summary
Norfolk, NE

Run	Name	Annual Energy Use [MMBtu]	Annual Energy Cost [$]	Cost Savings vs. Avg. Base [$]	Savings vs Avg. Base [%]	Energy Use Reduction vs. Base* [MMBtu]	Energy Use Reduction vs. Base* [%]	Notes
0.00	Base Case	515.5	$7,420					
	Base +90°	523.9	$7,571					ASHRAE 90.1-2004 Baseline
	Base +180°	515.5	$7,420					Appendix G
	Base +270°	523.6	$7,571					Walls: U-0.084; Roof: U-0.063; Floors - U-0.052
	Avg Base Case	519.625	$7,496					Windows: U-0.57, SHGC-0.39
1.10	2003 IECC	547.6	$7,777	-$281	-3.8%	-27.98	-5.4%	2003 IECC
1.11	2006 IECC	515.7	$7,400	$96	1.3%	3.92	0.8%	2006 IECC
3.42	As Designed	351.5	$5,689	$1,807	24.1%	168.13	32.4%	Alternative

*Energy consumption reported excluding Misc Equipment electrical end-use


Baseline Energy End-uses
DHW
1.6%
Fans - Ventilation
15.1%
Conditioned Lighting
17.9%
Pumps & Aux
0.7%
Unconditioned
Lighting
2.1%
Space Cooling
11.4%
Space Heating
51.2%
Conditioned Lighting
Unconditioned
Lighting
Space Heating
Space Cooling
Pumps & Aux
Fans - Ventilation
DHW
SMALL RETAIL WITH 8% WWR (NORFOLK, NE)

Small Retail 8% Glass Energy Results Summary
Norfolk, NE

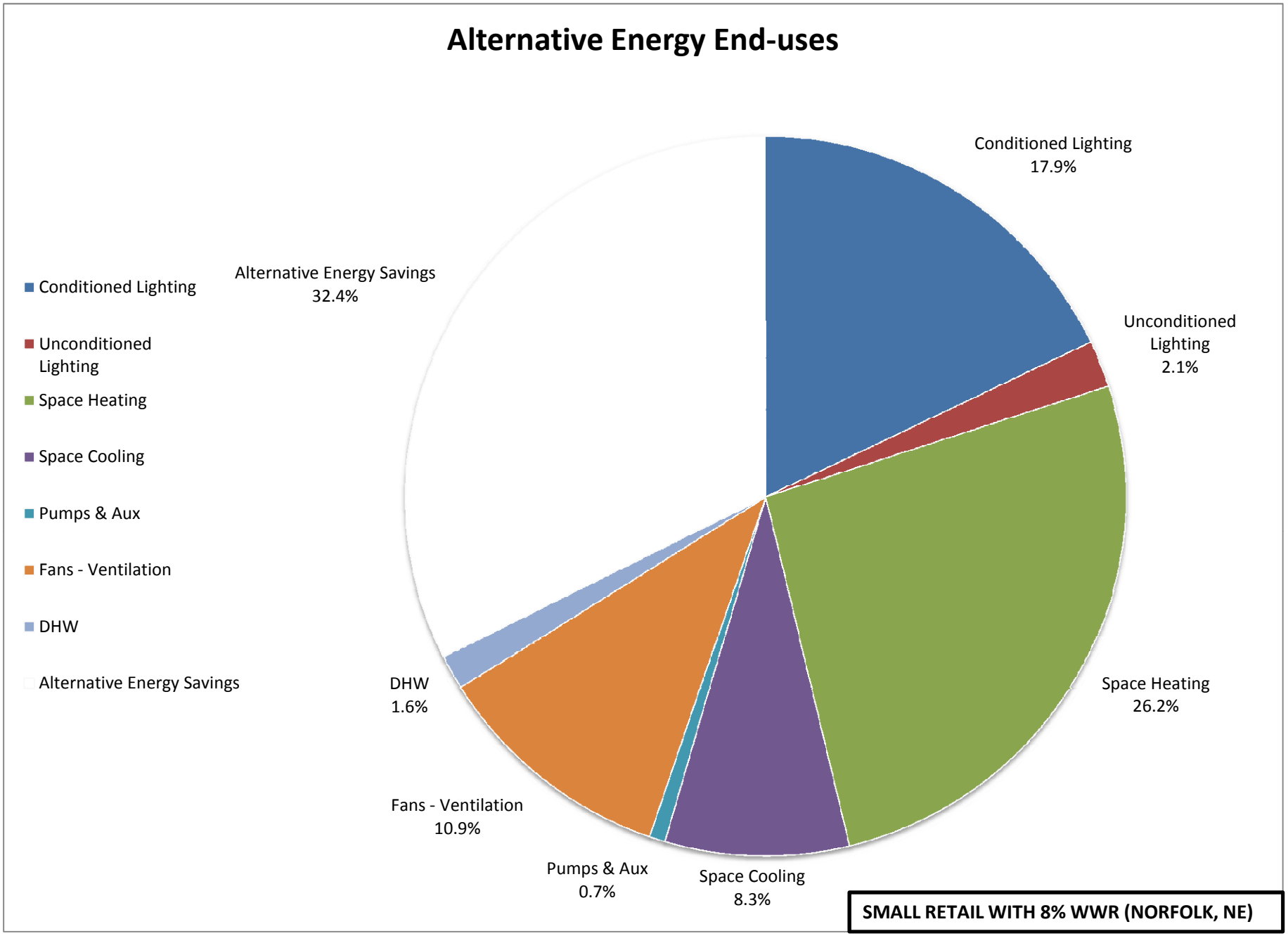
Building Energy Performance Summary - Base Case

End Use	*Energy Source*	*Baseline Building*		*Baseline Building +90*		*Baseline Building +180*		*Baseline Building +270*		Baseline Average		*% End Use of Baseline*
		Energy [MMbtu]	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	
Conditioned Lighting	Electricity	93.1	6.8	93.1	6.8	93.1	6.8	93.1	6.8	93.1	6.8	13.7%
Unconditioned Lighting	Electricity	10.9	0.6	10.9	0.6	10.9	0.6	10.9	0.6	10.9	0.6	1.6%
Misc Equipment	Electricity	161.3	11.7	161.3	11.7	161.3	11.7	161.3	11.7	161.3	11.7	23.7%
Space Heating	Electricity									0.0	0.0	0.0%
Space Heating	Gas	265.1	0.3	266.8	0.3	265.0	0.3	266.8	0.3	265.9	0.3	39.1%
Space Heating	Steam/ HW									0.0	0.0	0.0%
Space Cooling	Electricity	57.9	17.5	61.0	18.3	58.0	17.5	61.0	18.3	59.5	17.9	8.7%
Space Cooling	CHW									0.0	0.0	0.0%
Heat Rejection	Electricity									0.0	0.0	0.0%
Pumps & Aux	Electricity	3.7	0.0	3.7	0.0	3.7	0.0	3.3	0.0	3.6	0.0	0.5%
Fans - Ventilation	Electricity	76.6	3.8	80.2	3.9	76.6	3.8	80.3	3.9	78.4	3.9	11.5%
Fans - Exhaust	Electricity									0.0	0.0	0.0%
Refrigeration	Electricity									0.0	0.0	0.0%
HP Supplement	Electricity									0.0	0.0	0.0%
DHW	Elec									0.0	0.0	0.0%
DHW	Gas	8.2	0.0	8.2	0.0	8.2	0.0	8.2	0.0	8.2	0.0	1.2%
Total w/o Misc Equipment		515.5		523.9		515.5		523.6		519.625		
Total w/ Misc Equipment		676.8		685.2		676.8		684.9		680.925		

Energy Cost Summary

Energy Source	*Baseline Cost*	*Baseline Cost +90*	*Baseline Cost +180*	*Baseline Cost +270*	**Baseline Average**
Electricity*	$4,960	$5,096	$4,960	$5,096	**$5,028**
Gas	$2,460	$2,475	$2,460	$2,475	**$2,468**
Total	**$7,420**	**$7,571**	**$7,420**	**$7,571**	**$7,496**

*Electricity cost excludes Misc Equipment electrical consumption cost (based upon virtual rate)
DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms


Alternative Energy End-uses
Conditioned Lighting
Unconditioned Lighting
Space Heating
Space Cooling
Pumps & Aux
Fans - Ventilation
DHW
Alternative Energy Savings
Conditioned Lighting 17.9%
Unconditioned Lighting 2.1%
Space Heating 26.2%
Space Cooling 8.3%
Pumps & Aux 0.7%
Fans - Ventilation 10.9%
DHW 1.6%
Alternative Energy Savings 32.4%
SMALL RETAIL WITH 8% WWR (NORFOLK, NE)

Small Retail 8% Glass Energy Results Summary
Norfolk, NE

Description: Alternative

Split system; 90% eff. furnace; CEE Tier 1; Improved wall, R-40 roof, and Solarban 70XL w/ thermally broken frame

Building Energy Performance Summary

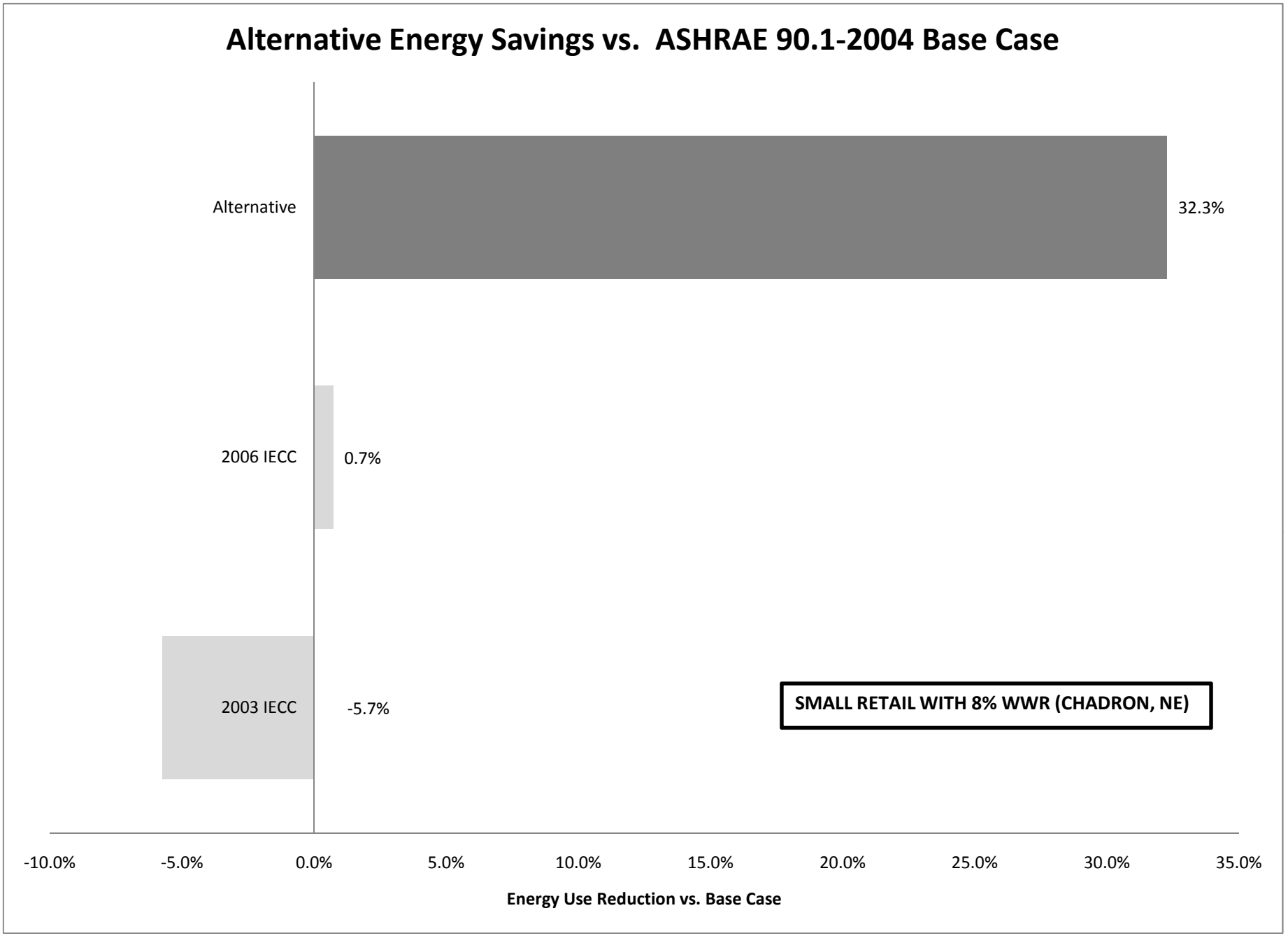
End Use	*Energy Source*	*Alternative Building*		*Average Baseline*		*Energy Difference Alt-Baseline*	*% of End Use of As Designed*	*Baseline Consumption Average*
		Energy [MMBtu]	*Peak [kW or therm/hr]*	*Energy [MMBtu]*	*Peak [kW or therm/hr]*	*[%]*	*[%]*	*[%]*
Conditioned Lighting	Electricity	93.1	6.8	93.1	6.8	0.0%	18.2%	13.7%
Unconditioned Lighting	Electricity	10.9	0.6	10.9	0.6	0.0%	2.1%	1.6%
Misc Equipment	Electricity	161.3	11.7	161.3	11.7	0.0%	31.5%	23.7%
Space Heating	Electricity			0.0	0.0		0.0%	0.0%
Space Heating	Gas	136.3	0.3	265.9	0.3	48.7%	26.6%	39.1%
Space Heating	Steam/ HW			0.0	0.0		0.0%	0.0%
Space Cooling	Elec	42.9	13.8	59.5	17.9	27.9%	8.4%	8.7%
Space Cooling	Chilled Water			0.0	0.0		0.0%	0.0%
Heat Rejection	Electricity			0.0	0.0		0.0%	0.0%
Pumps & Aux	Electricity	3.7	0.0	3.6	0.0	-2.8%	0.7%	0.5%
Fans - Ventilation	Electricity	56.4	3.2	78.4	3.9	28.1%	11.0%	11.5%
Fans - Exhaust	Electricity			0.0	0.0		0.0%	0.0%
Refrigeration	Electricity			0.0	0.0		0.0%	0.0%
HP Supplement	Electricity			0.0	0.0		0.0%	0.0%
DHW	Elec			0.0	0.0		0.0%	0.0%
DHW	Gas	8.2	0.0	8.2	0.0	0.0%	1.6%	1.2%
Total w/o Misc Equipment		**351.5**		**519.6**		**32.4%**	100.0%	100.0%
Alternative Energy Savings		**168.1**						
Total w/ Misc Equipment		512.8		680.9				

Energy Cost Summary

Energy Source	*As Designed Cost*	*Baseline Cost*
Electricity*	$4,293	$5,028
Gas	$1,396	$2,468
Total	$5,689	$7,496

*Electricity cost excludes Misc Equipment electrical consumption cost (based upon virtual rate)

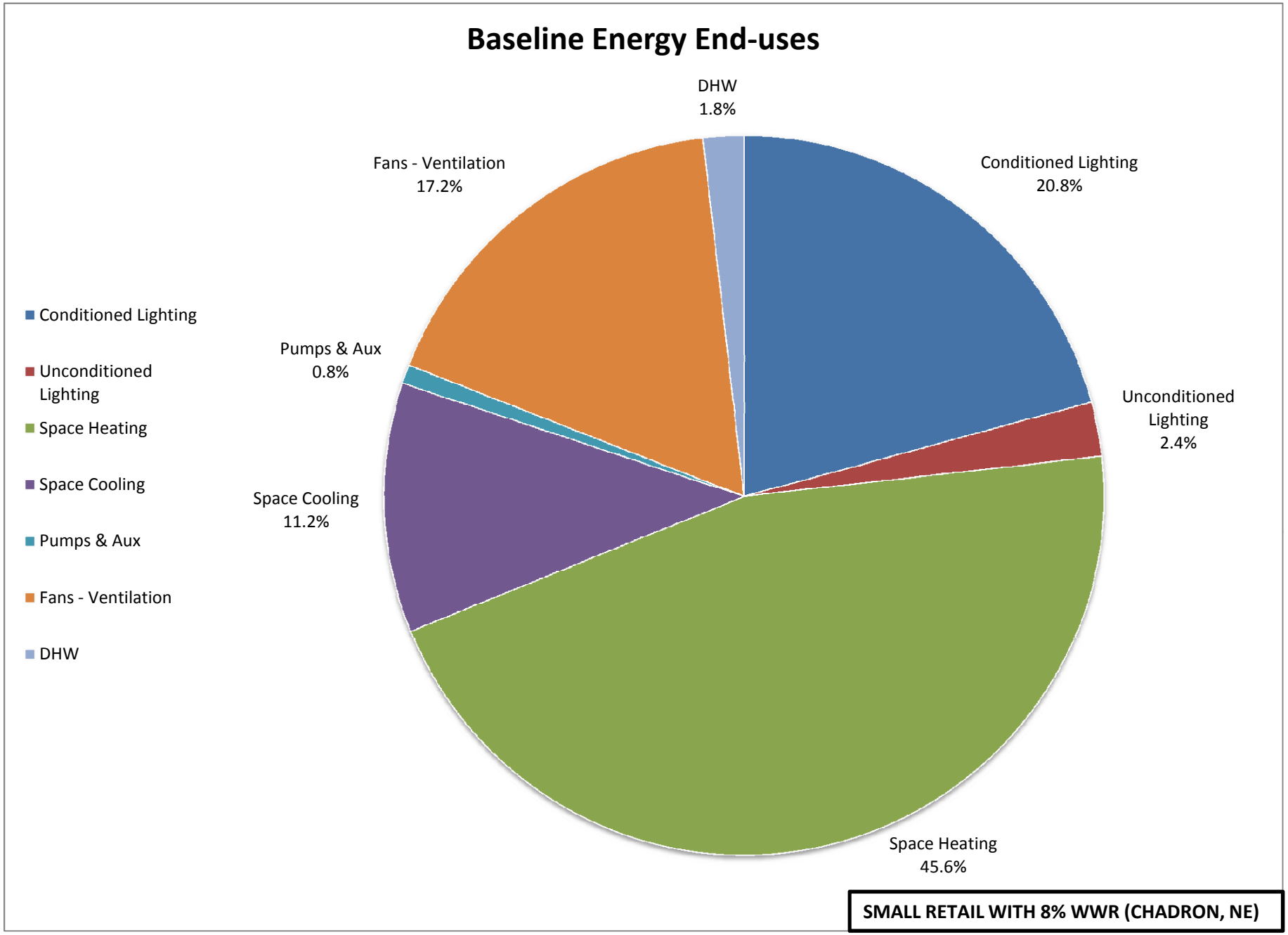
DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms


Alternative Energy Savings vs. ASHRAE 90.1-2004 Base Case
Alternative
32.3%
2006 IECC
0.7%
2003 IECC
-5.7%
SMALL RETAIL WITH 8% WWR (CHADRON, NE)
-10.0%
-5.0%
0.0%
5.0%
10.0%
15.0%
20.0%
25.0%
30.0%
35.0%
Energy Use Reduction vs. Base Case

Small Retail 8% Glass Energy Results Summary
Chadron, NE

Run	Name	Annual Energy Use [MMBtu]	Annual Energy Cost [$]	Cost Savings vs. Avg. Base [$]	Savings vs Avg. Base [%]	Energy Use Reduction vs. Base* [MMBtu]	Energy Use Reduction vs. Base* [%]	Notes
0.00	Base Case	444.3	$6,605					
	Base +90°	452.6	$6,769					ASHRAE 90.1-2004 Baseline
	Base +180°	444.3	$6,608					Appendix G
	Base +270°	451	$6,724					Walls: U-0.084; Roof: U-0.063; Floors - U-0.052
	Avg Base Case	448.05	$6,677					Windows: U-0.57, SHGC-0.39
1.10	2003 IECC	473.8	$6,941	-$264	-4.0%	-25.75	-5.7%	2003 IECC
1.11	2006 IECC	444.8	$6,576	$101	1.5%	3.25	0.7%	2006 IECC
3.42	As Designed	303.4	$4,992	$1,685	25.2%	144.65	32.3%	Alternative

*Energy consumption reported excluding Misc Equipment electrical end-use


Baseline Energy End-uses
DHW
1.8%
Fans - Ventilation
17.2%
Conditioned Lighting
20.8%
Pumps & Aux
0.8%
Unconditioned
Lighting
2.4%
Space Cooling
11.2%
Space Heating
45.6%
Conditioned Lighting
Unconditioned
Lighting
Space Heating
Space Cooling
Pumps & Aux
Fans - Ventilation
DHW
SMALL RETAIL WITH 8% WWR (CHADRON, NE)

Small Retail 8% Glass Energy Results Summary
Chadron, NE

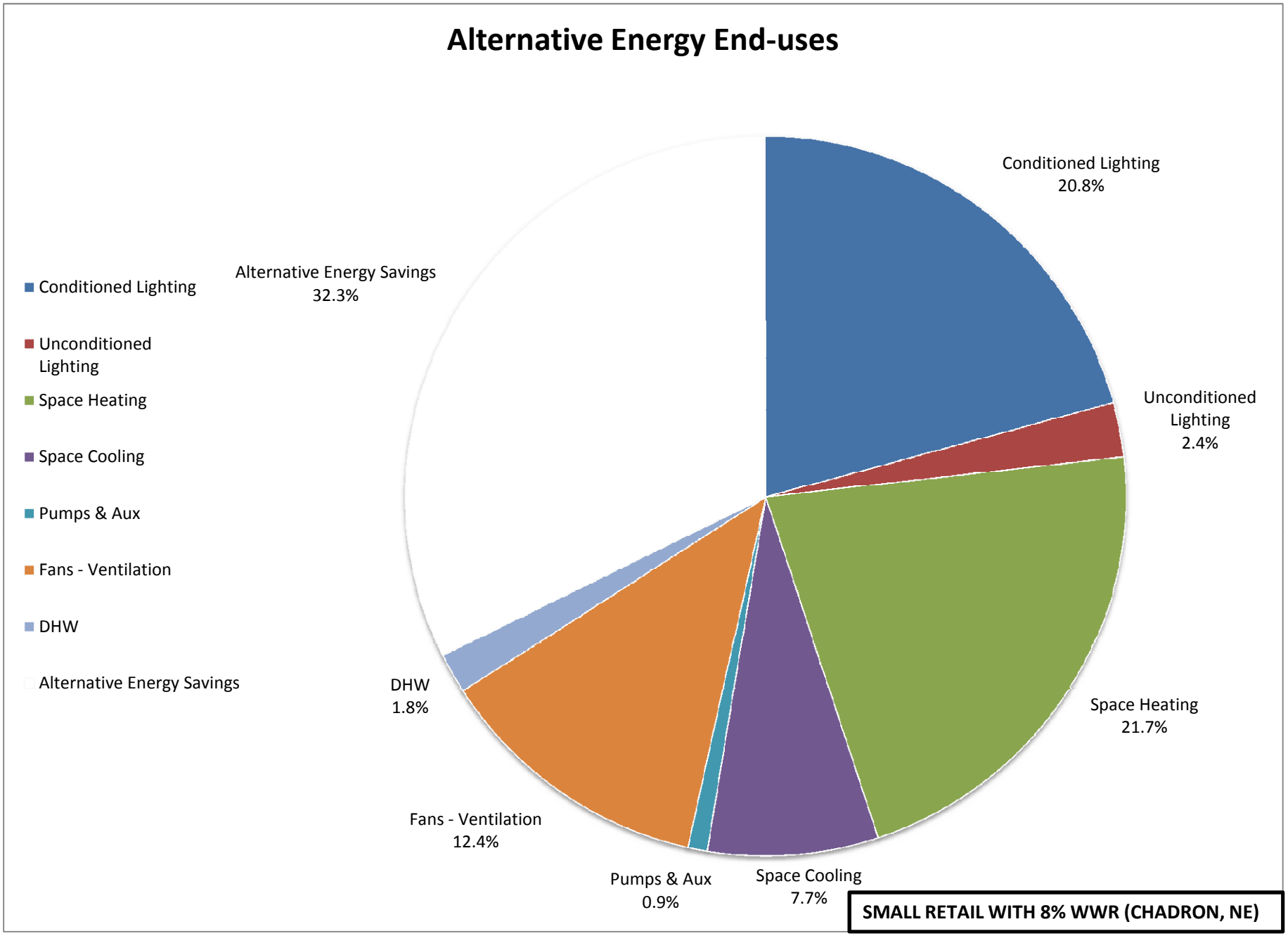
Building Energy Performance Summary - Base Case

End Use	*Energy Source*	*Baseline Building*		*Baseline Building +90*		*Baseline Building +180*		*Baseline Building +270*		Baseline Average		*% End Use of Baseline*
		Energy [MMbtu]	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	
Conditioned Lighting	Electricity	93.1	6.8	93.1	6.8	93.1	6.8	93.1	6.8	93.1	6.8	15.3%
Unconditioned Lighting	Electricity	10.9	0.6	10.9	0.6	10.9	0.6	10.9	0.6	10.9	0.6	1.8%
Misc Equipment	Electricity	161.3	11.7	161.3	11.7	161.3	11.7	161.3	11.7	161.3	11.7	26.5%
Space Heating	Electricity									0.0	0.0	0.0%
Space Heating	Gas	203.8	0.3	205.0	0.3	203.8	0.3	205.4	0.3	204.5	0.3	33.6%
Space Heating	Steam/ HW									0.0	0.0	0.0%
Space Cooling	Electricity	48.7	13.5	53.0	14.4	48.7	13.5	50.9	14.0	50.3	13.9	8.3%
Space Cooling	CHW									0.0	0.0	0.0%
Heat Rejection	Electricity									0.0	0.0	0.0%
Pumps & Aux	Electricity	3.8	0.0	3.8	0.0	3.8	0.0	3.8	0.0	3.8	0.0	0.6%
Fans - Ventilation	Electricity	75.8	3.8	78.6	3.9	75.8	3.8	78.7	3.9	77.2	3.9	12.7%
Fans - Exhaust	Electricity									0.0	0.0	0.0%
Refrigeration	Electricity									0.0	0.0	0.0%
HP Supplement	Electricity									0.0	0.0	0.0%
DHW	Elec									0.0	0.0	0.0%
DHW	Gas	8.2	0.0	8.2	0.0	8.2	0.0	8.2	0.0	8.2	0.0	1.3%
Total w/o Misc Equipment		444.3		452.6		444.3		451.0		448.05		
Total w/ Misc Equipment		605.6		613.9		605.6		612.3		609.35		

Energy Cost Summary

Energy Source	*Baseline Cost*	*Baseline Cost +90*	*Baseline Cost +180*	*Baseline Cost +270*	**Baseline Average**
Electricity*	$4,770	$4,922	$4,772	$4,875	**$4,835**
Gas	$1,835	$1,847	$1,836	$1,849	**$1,842**
Total	**$6,605**	**$6,769**	**$6,608**	**$6,724**	**$6,677**

*Electricity cost excludes Misc Equipment electrical consumption cost (based upon virtual rate)
DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms


Alternative Energy End-uses
Conditioned Lighting
Unconditioned Lighting
Space Heating
Space Cooling
Pumps & Aux
Fans - Ventilation
DHW
Alternative Energy Savings
Conditioned Lighting 20.8%
Unconditioned Lighting 2.4%
Space Heating 21.7%
Space Cooling 7.7%
Pumps & Aux 0.9%
Fans - Ventilation 12.4%
DHW 1.8%
Alternative Energy Savings 32.3%
SMALL RETAIL WITH 8% WWR (CHADRON, NE)

Small Retail 8% Glass Energy Results Summary
Chadron, NE

Description: Alternative

Split system; 90% eff. furnace; CEE Tier 1; Improved wall, R-40 roof, and Solarban 70XL w/ thermally broken frame

Building Energy Performance Summary

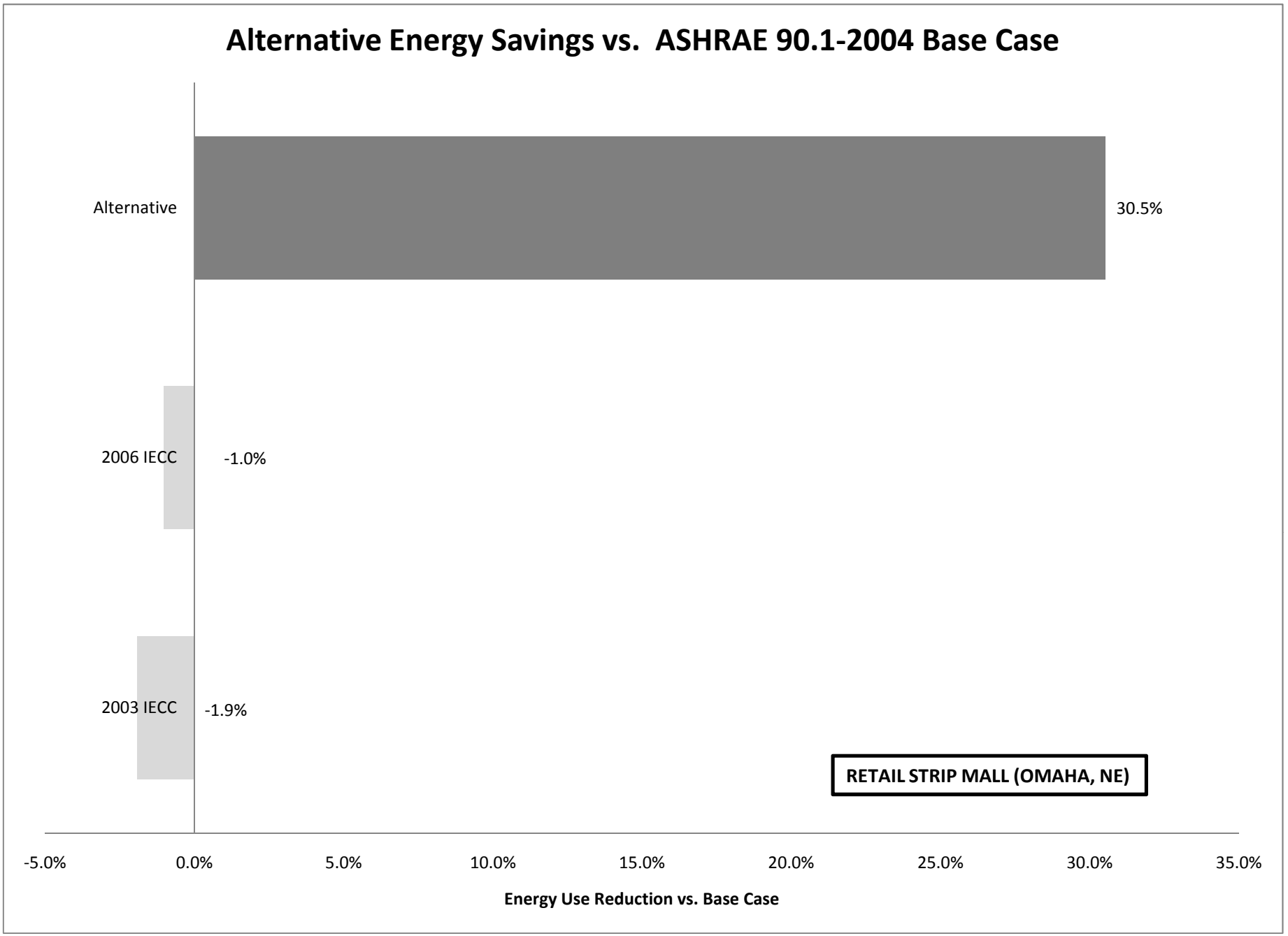
End Use	*Energy Source*	*Alternative Building*		*Average Baseline*		*Energy Difference Alt-Baseline*	*% of End Use of As Designed*	*Baseline Consumption Average*
		Energy [MMBtu]	*Peak [kW or therm/hr]*	*Energy [MMBtu]*	*Peak [kW or therm/hr]*	*[%]*	*[%]*	*[%]*
Conditioned Lighting	Electricity	93.1	6.8	93.1	6.8	0.0%	20.0%	15.3%
Unconditioned Lighting	Electricity	10.9	0.6	10.9	0.6	0.0%	2.3%	1.8%
Misc Equipment	Electricity	161.3	11.1	161.3	11.7	0.0%	34.7%	26.5%
Space Heating	Electricity			0.0	0.0		0.0%	0.0%
Space Heating	Gas	97.3	0.3	204.5	0.3	52.4%	20.9%	33.6%
Space Heating	Steam/ HW			0.0	0.0		0.0%	0.0%
Space Cooling	Elec	34.3	10.8	50.3	13.9	31.8%	7.4%	8.3%
Space Cooling	Chilled Water			0.0	0.0		0.0%	0.0%
Heat Rejection	Electricity			0.0	0.0		0.0%	0.0%
Pumps & Aux	Electricity	3.9	0.0	3.8	0.0	-2.6%	0.8%	0.6%
Fans - Ventilation	Electricity	55.7	3.2	77.2	3.9	27.9%	12.0%	12.7%
Fans - Exhaust	Electricity			0.0	0.0		0.0%	0.0%
Refrigeration	Electricity			0.0	0.0		0.0%	0.0%
HP Supplement	Electricity			0.0	0.0		0.0%	0.0%
DHW	Elec			0.0	0.0		0.0%	0.0%
DHW	Gas	8.2	0.0	8.2	0.0	0.0%	1.8%	1.3%
Total w/o Misc Equipment		**303.4**		**448.1**		**32.3%**	100.0%	100.0%
Alternative Energy Savings		**144.7**						
Total w/ Misc Equipment		464.7		609.4				

Energy Cost Summary

Energy Source	*As Designed Cost*	*Baseline Cost*
Electricity*	$4,078	$4,835
Gas	$914	$1,842
Total	$4,992	$6,677

*Electricity cost excludes Misc Equipment electrical consumption cost (based upon virtual rate)

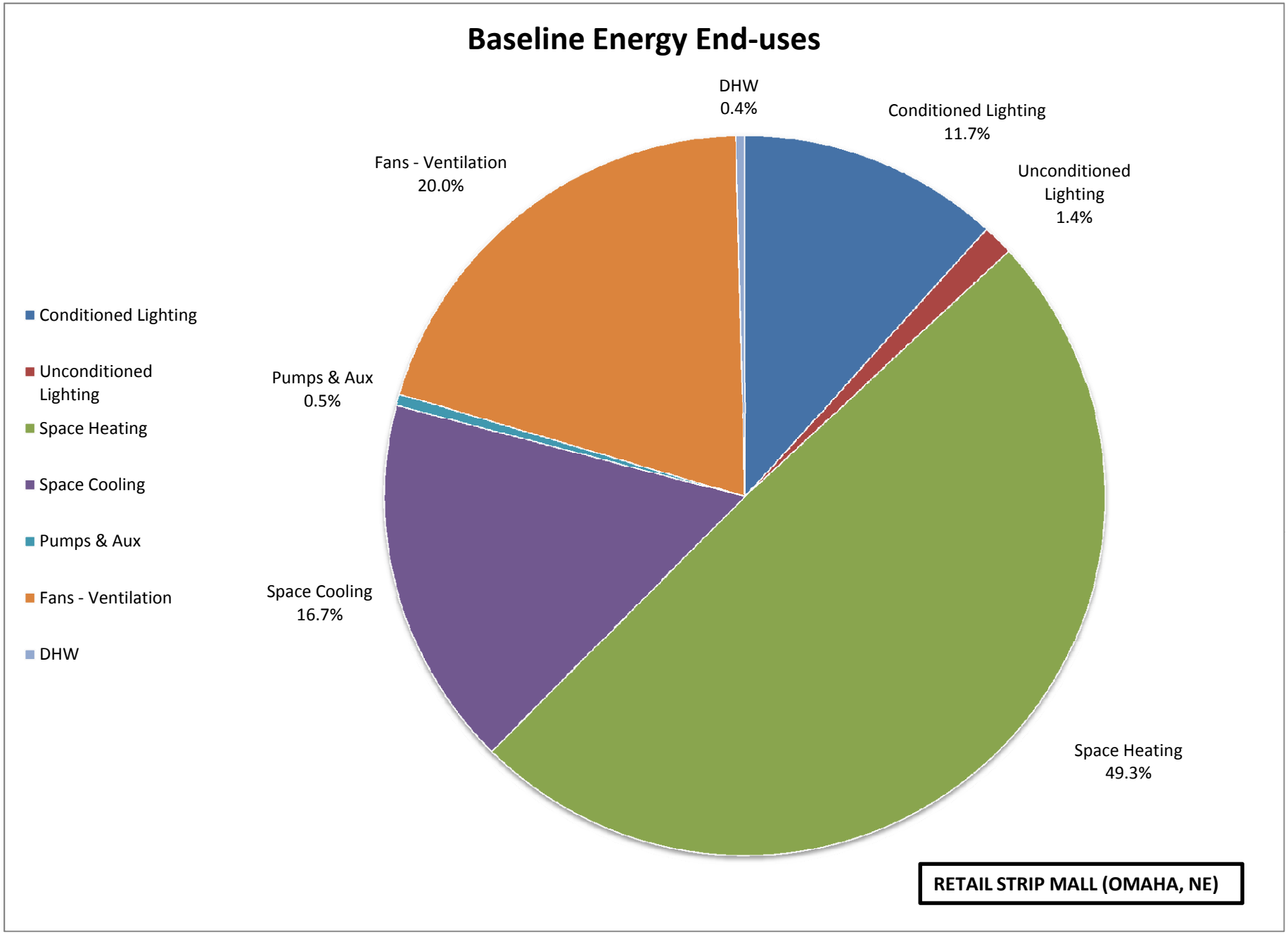
DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms


Alternative Energy Savings vs. ASHRAE 90.1-2004 Base Case
Alternative
30.5%
2006 IECC
-1.0%
2003 IECC
-1.9%
RETAIL STRIP MALL (OMAHA, NE)
-5.0%
0.0%
5.0%
10.0%
15.0%
20.0%
25.0%
30.0%
35.0%
Energy Use Reduction vs. Base Case

Retail Strip Mall Energy Results Summary
Omaha, NE

Run	Name	Annual Energy Use* [MMBtu]	Annual Energy Cost* [$]	Cost Savings vs. Avg. Base* [$]	Savings vs Avg. Base* [%]	Energy Use Reduction vs. Base* [MMBtu]	Energy Use Reduction vs. Base* [%]	Notes
0.00	Base Case	2120.9	$35,484					
	Base +90°	2138.9	$35,880					ASHRAE 90.1-2004 Baseline
	Base +180°	2118.3	$35,366					Appendix G
	Base +270°	2154.9	$36,021					Walls: U-0.084; Roof: U-0.063; Floors - U-0.052
	Avg Base Case	2133.25	$35,688					Windows: U-0.57, SHGC-0.39
1.10	2003 IECC	2174	$36,960	-$1,273	-3.6%	-40.75	-1.9%	2003 IECC
1.11	2006 IECC	2155	$36,792	-$1,104	-3.1%	-21.75	-1.0%	2006 IECC
3.42	As Designed	1482	$21,324	$14,364	40.2%	651.25	30.5%	Alternative

*Reported excluding Misc Equipment electrical end-use


Baseline Energy End-uses
DHW
0.4%
Conditioned Lighting
11.7%
Unconditioned
Lighting
1.4%
Fans - Ventilation
20.0%
Pumps & Aux
0.5%
Space Cooling
16.7%
Space Heating
49.3%
Conditioned Lighting
Unconditioned
Lighting
Space Heating
Space Cooling
Pumps & Aux
Fans - Ventilation
DHW
RETAIL STRIP MALL (OMAHA, NE)

Retail Strip Mall Energy Results Summary
Omaha, NE

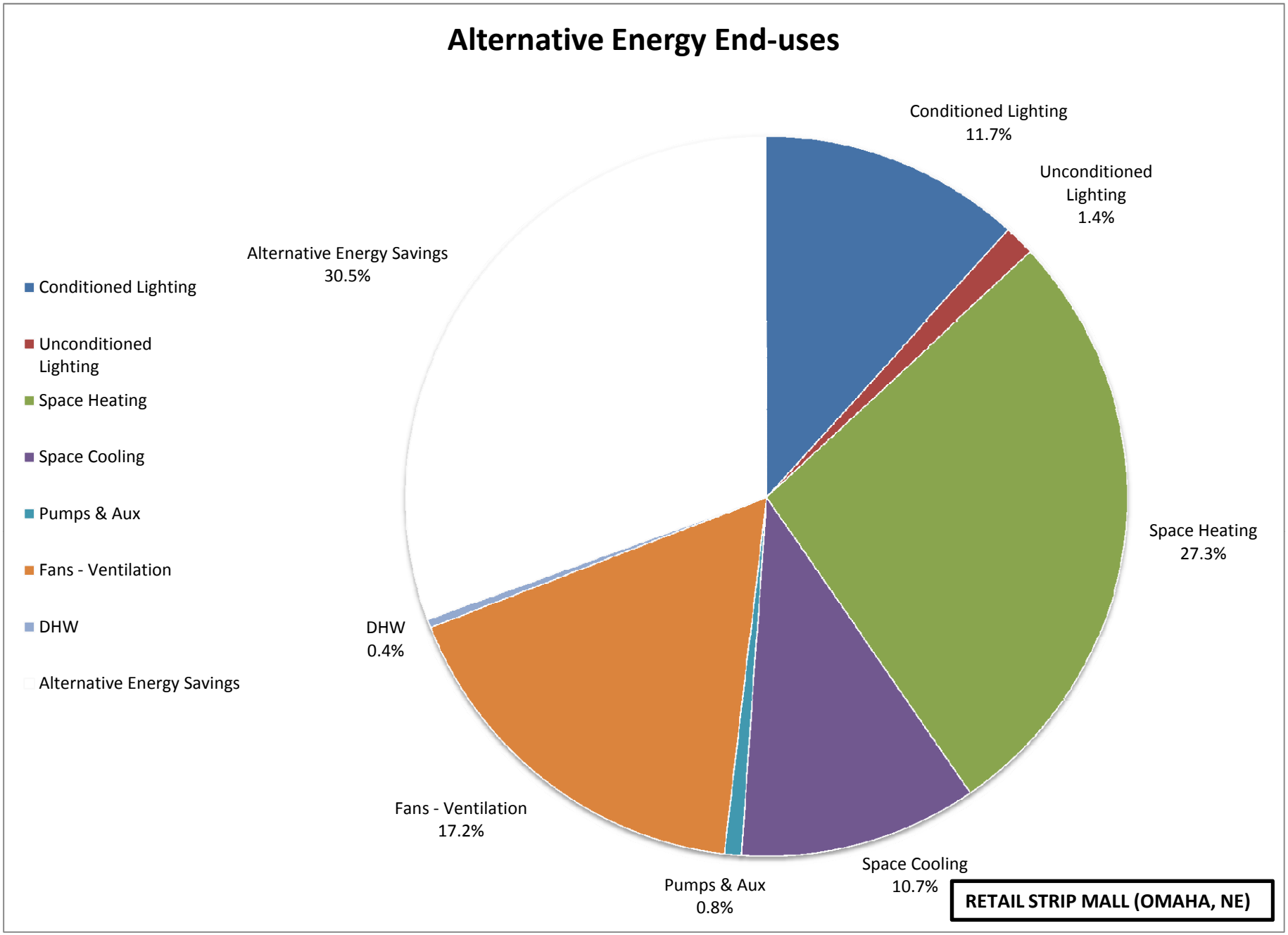
Building Energy Performance Summary - Base Case

End Use	*Energy Source*	*Baseline Building*		*Baseline Building +90*		*Baseline Building +180*		*Baseline Building +270*		Baseline Average		*% End Use of Baseline*
		Energy [MMbtu]	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	
Conditioned Lighting	Electricity	250.4	18.2	250.4	18.2	250.4	18.2	250.4	18.2	250.4	18.2	8.7%
Unconditioned Lighting	Electricity	29.4	0.0	29.4	0.0	29.4	0.0	29.4	0.0	29.4	0.0	1.0%
Misc Equipment	Electricity	735.4	51.3	735.4	52.0	735.4	51.3	735.4	52.0	735.4	51.7	25.6%
Space Heating	Electricity									0.0	0.0	0.0%
Space Heating	Gas	1051.7	1.2	1041.7	1.1	1054.4	1.2	1057.4	1.2	1051.3	1.2	36.6%
Space Heating	Steam/ HW									0.0	0.0	0.0%
Space Cooling	Electricity	351.8	74.2	360.6	74.6	350.2	74.2	360.2	74.4	355.7	74.4	12.4%
Space Cooling	CHW									0.0	0.0	0.0%
Heat Rejection	Electricity									0.0	0.0	0.0%
Pumps & Aux	Electricity	11.0	0.0	11.1	0.0	11.1	0.0	11.0	0.0	11.1	0.0	0.4%
Fans - Ventilation	Electricity	418.3	21.4	437.4	22.2	414.5	21.2	438.2	22.3	427.1	21.8	14.9%
Fans - Exhaust	Electricity									0.0	0.0	0.0%
Refrigeration	Electricity									0.0	0.0	0.0%
HP Supplement	Electricity									0.0	0.0	0.0%
DHW	Elec									0.0	0.0	0.0%
DHW	Gas	8.3	0.0	8.3	0.0	8.3	0.0	8.3	0.0	8.3	0.0	0.3%
Total w/o Misc Equipment		2120.9		2138.9		2118.3		2154.9		2133.25		
Total w/ Misc Equipment		2856.3		2874.3		2853.7		2890.3		2868.65		

Energy Cost Summary

Energy Source	*Baseline Cost*	*Baseline Cost +90*	*Baseline Cost +180*	*Baseline Cost +270*	**Baseline Average**
Electricity*	$25,370	$25,859	$25,229	$25,855	**$25,578**
Gas	$10,114	$10,021	$10,137	$10,166	**$10,110**
Total	**$35,484**	**$35,880**	**$35,366**	**$36,021**	**$35,688**

*Electricity cost excludes Misc Equipment electrical consumption cost (based upon virtual rate)
DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms


Alternative Energy End-uses
Conditioned Lighting
11.7%
Unconditioned
Lighting
1.4%
Space Heating
27.3%
Space Cooling
10.7%
Pumps & Aux
0.8%
Fans - Ventilation
17.2%
DHW
0.4%
Alternative Energy Savings
30.5%
Conditioned Lighting
Unconditioned
Lighting
Space Heating
Space Cooling
Pumps & Aux
Fans - Ventilation
DHW
Alternative Energy Savings
RETAIL STRIP MALL (OMAHA, NE)

Retail Strip Mall Energy Results Summary
Omaha, NE

Description: Alternative

Packaged Rooftop; 90% eff. furnace; Energy Recovery Wheel; CEE Tier 1; Improved wall; and Solarban 70XL w/ thermally broken frame

Building Energy Performance Summary

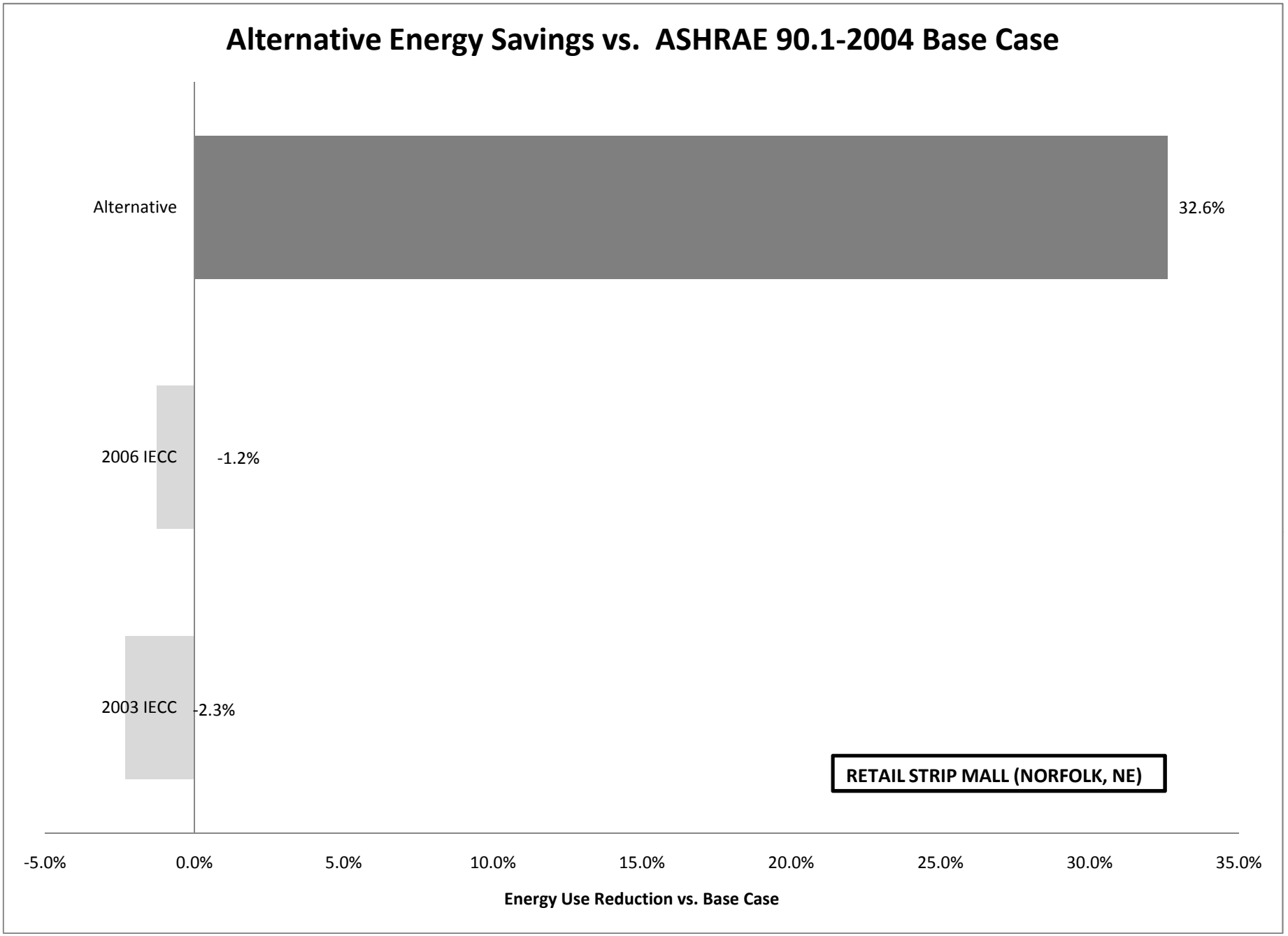
End Use	*Energy Source*	*Alternative Building*		*Average Baseline*		*Energy Difference Alt-Baseline*	*% of End Use of As Designed*	*Baseline Consumption Average*
		Energy [MMBtu]	*Peak [kW or therm/hr]*	*Energy [MMBtu]*	*Peak [kW or therm/hr]*	*[%]*	*[%]*	*[%]*
Conditioned Lighting	Electricity	250.4	18.2	250.4	18.2	0.0%	11.3%	8.7%
Unconditioned Lighting	Electricity	29.4	0.0	29.4	0.0	0.0%	1.3%	1.0%
Misc Equipment	Electricity	735.4	49.9	735.4	51.7	0.0%	33.2%	25.6%
Space Heating	Electricity			0.0	0.0		0.0%	0.0%
Space Heating	Gas	582.2	0.5	1051.3	1.2	44.6%	26.3%	36.6%
Space Heating	Steam/ HW			0.0	0.0		0.0%	0.0%
Space Cooling	Elec	228.1	51.1	355.7	74.4	35.9%	10.3%	12.4%
Space Cooling	Chilled Water			0.0	0.0		0.0%	0.0%
Heat Rejection	Electricity			0.0	0.0		0.0%	0.0%
Pumps & Aux	Electricity	16.2	0.4	11.1	0.0	-46.6%	0.7%	0.4%
Fans - Ventilation	Electricity	367.4	19.9	427.1	21.8	14.0%	16.6%	14.9%
Fans - Exhaust	Electricity			0.0	0.0		0.0%	0.0%
Refrigeration	Electricity			0.0	0.0		0.0%	0.0%
HP Supplement	Electricity			0.0	0.0		0.0%	0.0%
DHW	Elec			0.0	0.0		0.0%	0.0%
DHW	Gas	8.3	0.0	8.3	0.0	0.0%	0.4%	0.3%
Total w/o Misc Equipment		**1482.0**		**2133.3**		**30.5%**	100.0%	100.0%
Alternative Energy Savings		**651.3**						
Total w/ Misc Equipment		2217.4		2868.7				

Energy Cost Summary

Energy Source	*As Designed Cost*	*Baseline Cost*
Electricity*	$15,622	$25,578
Gas	$5,702	$10,110
Total	$21,324	$35,688

*Electricity cost excludes Misc Equipment electrical consumption cost (based upon virtual rate)

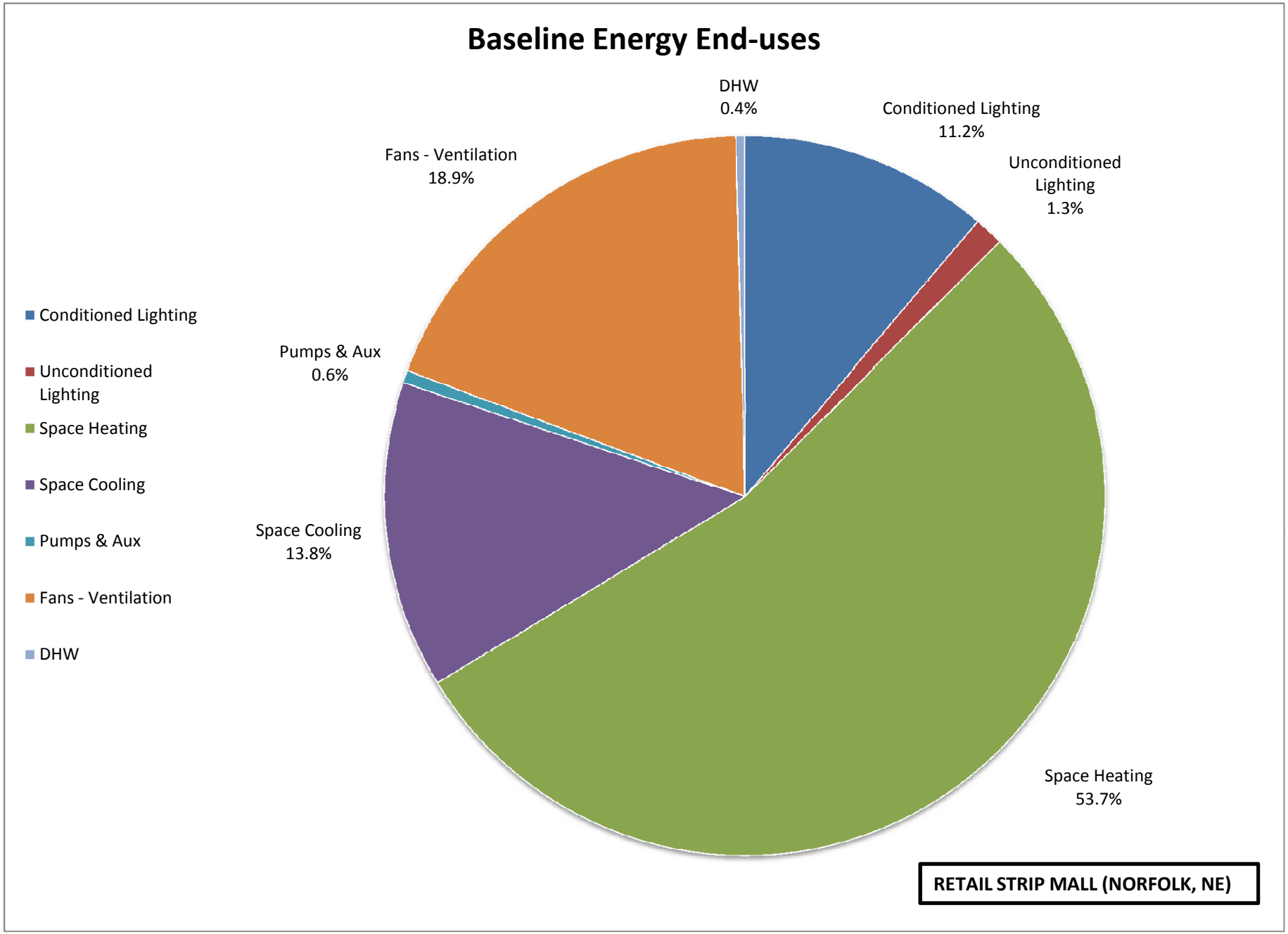
DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms


Alternative Energy Savings vs. ASHRAE 90.1-2004 Base Case
Alternative
32.6%
2006 IECC
-1.2%
2003 IECC
-2.3%
RETAIL STRIP MALL (NORFOLK, NE)
-5.0%
0.0%
5.0%
10.0%
15.0%
20.0%
25.0%
30.0%
35.0%
Energy Use Reduction vs. Base Case

Retail Strip Mall Energy Results Summary
Norfolk, NE

Run	Name	Annual Energy Use* [MMBtu]	Annual Energy Cost* [$]	Cost Savings vs. Avg. Base* [$]	Savings vs Avg. Base* [%]	Energy Use Reduction vs. Base* [MMBtu]	Energy Use Reduction vs. Base* [%]	Notes
0.00	Base Case	2215.9	$30,045					
	Base +90°	2254.7	$30,686					ASHRAE 90.1-2004 Baseline
	Base +180°	2196.5	$30,226					Appendix G
	Base +270°	2250.6	$30,668					Walls: U-0.084; Roof: U-0.063; Floors - U-0.052
	Avg Base Case	2229.425	$30,407					Windows: U-0.57, SHGC-0.39
1.10	2003 IECC	2281	$31,338	-$932	-3.1%	-51.58	-2.3%	2003 IECC
1.11	2006 IECC	2257.2	$31,152	-$746	-2.5%	-27.78	-1.2%	2006 IECC
3.42	As Designed	1502.4	$22,230	$8,176	26.9%	727.03	32.6%	Alternative

*Reported excluding Misc Equipment electrical end-use


Baseline Energy End-uses
DHW
0.4%
Conditioned Lighting
11.2%
Unconditioned
Lighting
1.3%
Fans - Ventilation
18.9%
Pumps & Aux
0.6%
Space Cooling
13.8%
Space Heating
53.7%
Conditioned Lighting
Unconditioned
Lighting
Space Heating
Space Cooling
Pumps & Aux
Fans - Ventilation
DHW
RETAIL STRIP MALL (NORFOLK, NE)

Retail Strip Mall Energy Results Summary
Norfolk, NE

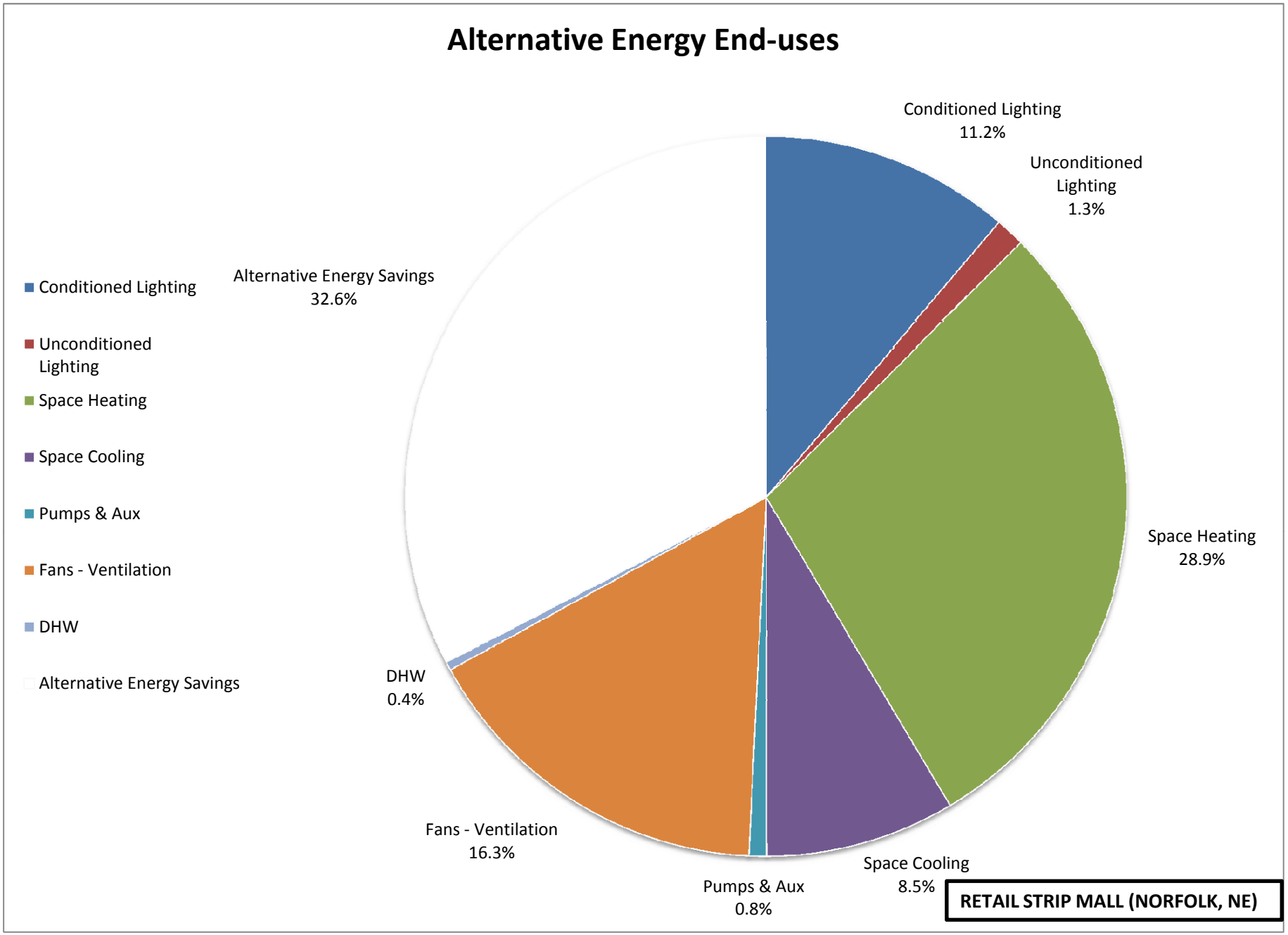
Building Energy Performance Summary - Base Case

End Use	*Energy Source*	*Baseline Building*		*Baseline Building +90*		*Baseline Building +180*		*Baseline Building +270*		Baseline Average		*% End Use of Baseline*
		Energy [MMbtu]	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	
Conditioned Lighting	Electricity	250.4	18.2	250.4	18.2	250.4	18.2	250.4	18.2	250.4	18.2	8.4%
Unconditioned Lighting	Electricity	29.4	1.6	29.4	1.6	29.4	1.6	29.4	1.6	29.4	1.6	1.0%
Misc Equipment	Electricity	735.4	52.0	735.4	52.0	735.4	52.0	735.4	52.0	735.4	52.0	24.8%
Space Heating	Electricity									0.0	0.0	0.0%
Space Heating	Gas	1188.1	1.2	1197.8	1.2	1213.3	1.2	1192.9	1.2	1198.0	1.2	40.4%
Space Heating	Steam/ HW									0.0	0.0	0.0%
Space Cooling	Electricity	304.5	62.4	311.8	62.8	305.9	63.5	311.5	66.6	308.4	63.8	10.4%
Space Cooling	CHW									0.0	0.0	0.0%
Heat Rejection	Electricity									0.0	0.0	0.0%
Pumps & Aux	Electricity	12.3	0.0	12.4	0.0	12.4	0.0	12.3	0.0	12.4	0.0	0.4%
Fans - Ventilation	Electricity	422.6	19.8	444.3	20.4	376.5	19.5	445.5	20.5	422.2	20.1	14.2%
Fans - Exhaust	Electricity									0.0	0.0	0.0%
Refrigeration	Electricity									0.0	0.0	0.0%
HP Supplement	Electricity									0.0	0.0	0.0%
DHW	Elec									0.0	0.0	0.0%
DHW	Gas	8.6	0.0	8.6	0.0	8.6	0.0	8.6	0.0	8.6	0.0	0.3%
Total w/o Misc Equipment		2215.9		2254.7		2196.5		2250.6		2229.425		
Total w/ Misc Equipment		2951.3		2990.1		2931.9		2986.0		2964.825		

Energy Cost Summary

Energy Source	*Baseline Cost*	*Baseline Cost +90*	*Baseline Cost +180*	*Baseline Cost +270*	**Baseline Average**
Electricity*	$19,960	$20,521	$19,933	$20,543	**$20,240**
Gas	$10,085	$10,165	$10,293	$10,125	**$10,167**
Total	**$30,045**	**$30,686**	**$30,226**	**$30,668**	**$30,407**

*Electricity cost excludes Misc Equipment electrical consumption cost (based upon virtual rate)
DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms


Alternative Energy End-uses
Conditioned Lighting
11.2%
Unconditioned
Lighting
1.3%
Space Heating
28.9%
Space Cooling
8.5%
Pumps & Aux
0.8%
Fans - Ventilation
16.3%
DHW
0.4%
Alternative Energy Savings
32.6%
Conditioned Lighting
Unconditioned
Lighting
Space Heating
Space Cooling
Pumps & Aux
Fans - Ventilation
DHW
Alternative Energy Savings
RETAIL STRIP MALL (NORFOLK, NE)

Retail Strip Mall Energy Results Summary
Norfolk, NE

Description: Alternative

Packaged Rooftop; 90% eff. furnace; Energy Recovery Wheel; CEE Tier 1; Improved wall; and Solarban 70XL w/ thermally broken frame

Building Energy Performance Summary

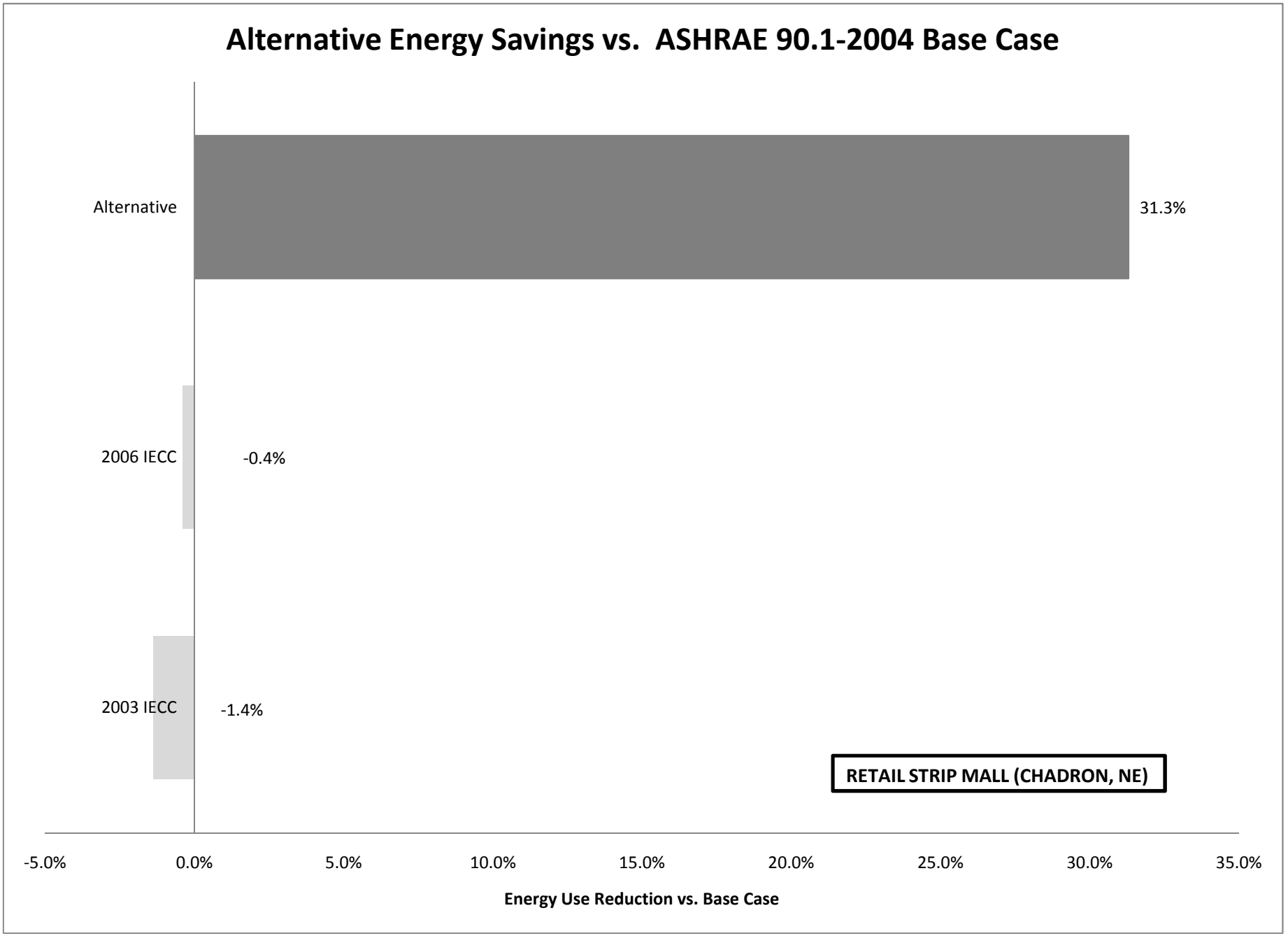
End Use	*Energy Source*	*Alternative Building*		*Average Baseline*		*Energy Difference Alt-Baseline*	*% of End Use of As Designed*	*Baseline Consumption Average*
		Energy [MMBtu]	*Peak [kW or therm/hr]*	*Energy [MMBtu]*	*Peak [kW or therm/hr]*	*[%]*	*[%]*	*[%]*
Conditioned Lighting	Electricity	250.4	18.2	250.4	18.2	0.0%	11.2%	8.4%
Unconditioned Lighting	Electricity	29.4	1.6	29.4	1.6	0.0%	1.3%	1.0%
Misc Equipment	Electricity	735.4	52.0	735.4	52.0	0.0%	32.9%	24.8%
Space Heating	Electricity			0.0	0.0		0.0%	0.0%
Space Heating	Gas	644.1	0.5	1198.0	1.2	46.2%	28.8%	40.4%
Space Heating	Steam/ HW			0.0	0.0		0.0%	0.0%
Space Cooling	Elec	189.8	43.2	308.4	63.8	38.5%	8.5%	10.4%
Space Cooling	Chilled Water			0.0	0.0		0.0%	0.0%
Heat Rejection	Electricity			0.0	0.0		0.0%	0.0%
Pumps & Aux	Electricity	17.7	0.4	12.4	0.0	-43.3%	0.8%	0.4%
Fans - Ventilation	Electricity	362.5	19.9	422.2	20.1	14.1%	16.2%	14.2%
Fans - Exhaust	Electricity			0.0	0.0		0.0%	0.0%
Refrigeration	Electricity			0.0	0.0		0.0%	0.0%
HP Supplement	Electricity			0.0	0.0		0.0%	0.0%
DHW	Elec			0.0	0.0		0.0%	0.0%
DHW	Gas	8.5	0.0	8.6	0.0	1.2%	0.4%	0.3%
Total w/o Misc Equipment		**1502.4**		**2229.4**		**32.6%**	100.0%	100.0%
Alternative Energy Savings		**727.0**						
Total w/ Misc Equipment		2237.8		2964.8				

Energy Cost Summary

Energy Source	*As Designed Cost*	*Baseline Cost*
Electricity*	$16,637	$20,240
Gas	$5,593	$10,167
Total	$22,230	$30,407

*Electricity cost excludes Misc Equipment electrical consumption cost (based upon virtual rate)

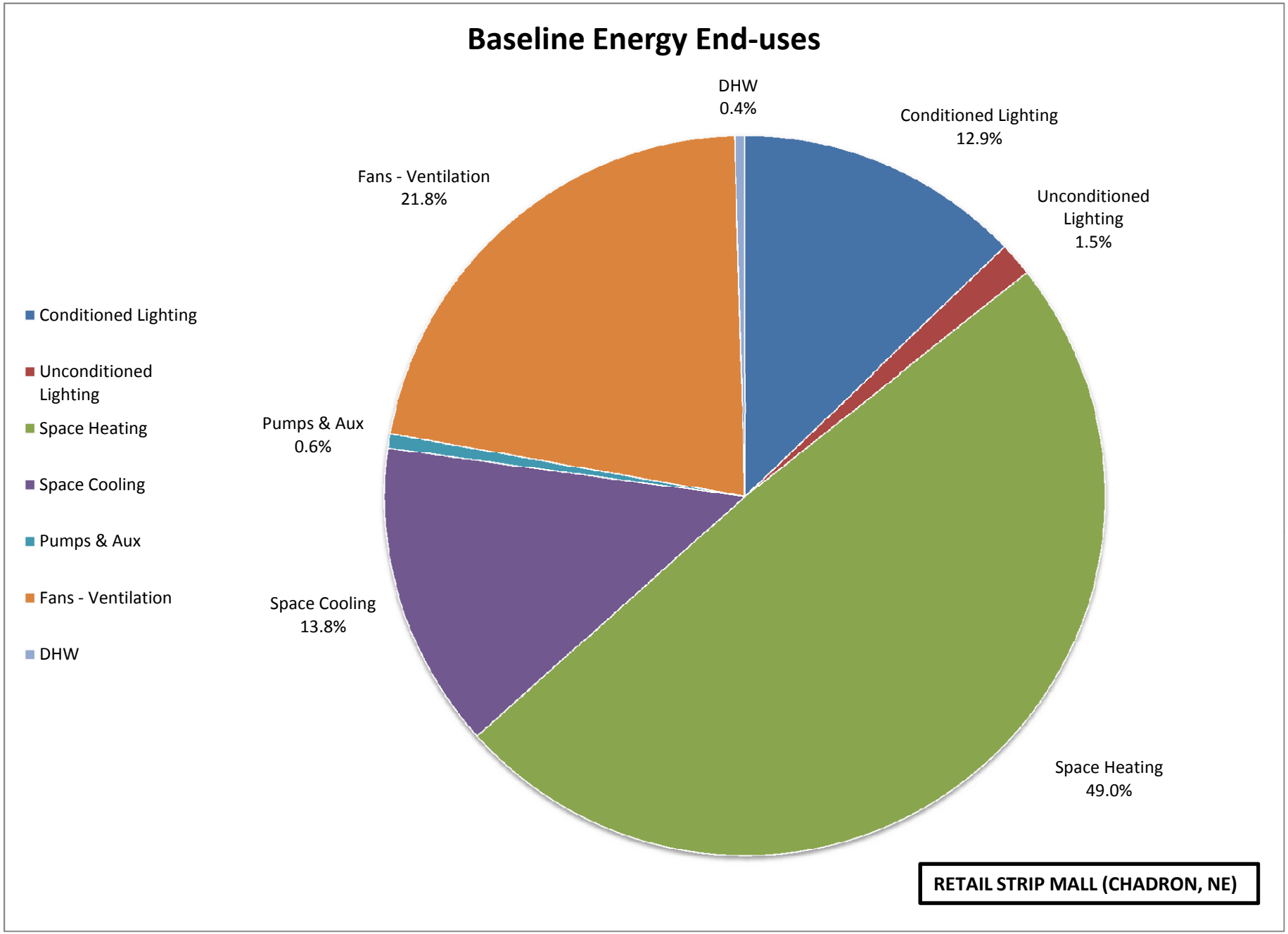
DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms


Alternative Energy Savings vs. ASHRAE 90.1-2004 Base Case
Alternative
31.3%
2006 IECC
-0.4%
2003 IECC
-1.4%
RETAIL STRIP MALL (CHADRON, NE)
-5.0%
0.0%
5.0%
10.0%
15.0%
20.0%
25.0%
30.0%
35.0%
Energy Use Reduction vs. Base Case

Retail Strip Mall Energy Results Summary
Chadron, NE

Run	Name	Annual Energy Use* [MMBtu]	Annual Energy Cost* [$]	Cost Savings vs. Avg. Base* [$]	Savings vs Avg. Base* [%]	Energy Use Reduction vs. Base* [MMBtu]	Energy Use Reduction vs. Base* [%]	Notes
0.00	Base Case	1937.5	$27,266					
	Base +90°	1949.6	$27,750					ASHRAE 90.1-2004 Baseline
	Base +180°	1934.2	$27,266					Appendix G
	Base +270°	1972.5	$28,007					Walls: U-0.084; Roof: U-0.063; Floors - U-0.052
	Avg Base Case	1948.45	$27,572					Windows: U-0.57, SHGC-0.39
1.10	2003 IECC	1975.2	$28,233	-$662	-2.4%	-26.75	-1.4%	2003 IECC
1.11	2006 IECC	1955.8	$28,082	-$511	-1.9%	-7.35	-0.4%	2006 IECC
3.42	As Designed	1338.5	$20,499	$7,072	25.7%	609.95	31.3%	Alternative

*Reported excluding Misc Equipment electrical end-use


Baseline Energy End-uses
DHW
0.4%
Conditioned Lighting
12.9%
Unconditioned
Lighting
1.5%
Fans - Ventilation
21.8%
Pumps & Aux
0.6%
Space Cooling
13.8%
Space Heating
49.0%
Conditioned Lighting
Unconditioned
Lighting
Space Heating
Space Cooling
Pumps & Aux
Fans - Ventilation
DHW
RETAIL STRIP MALL (CHADRON, NE)

Retail Strip Mall Energy Results Summary
Chadron, NE

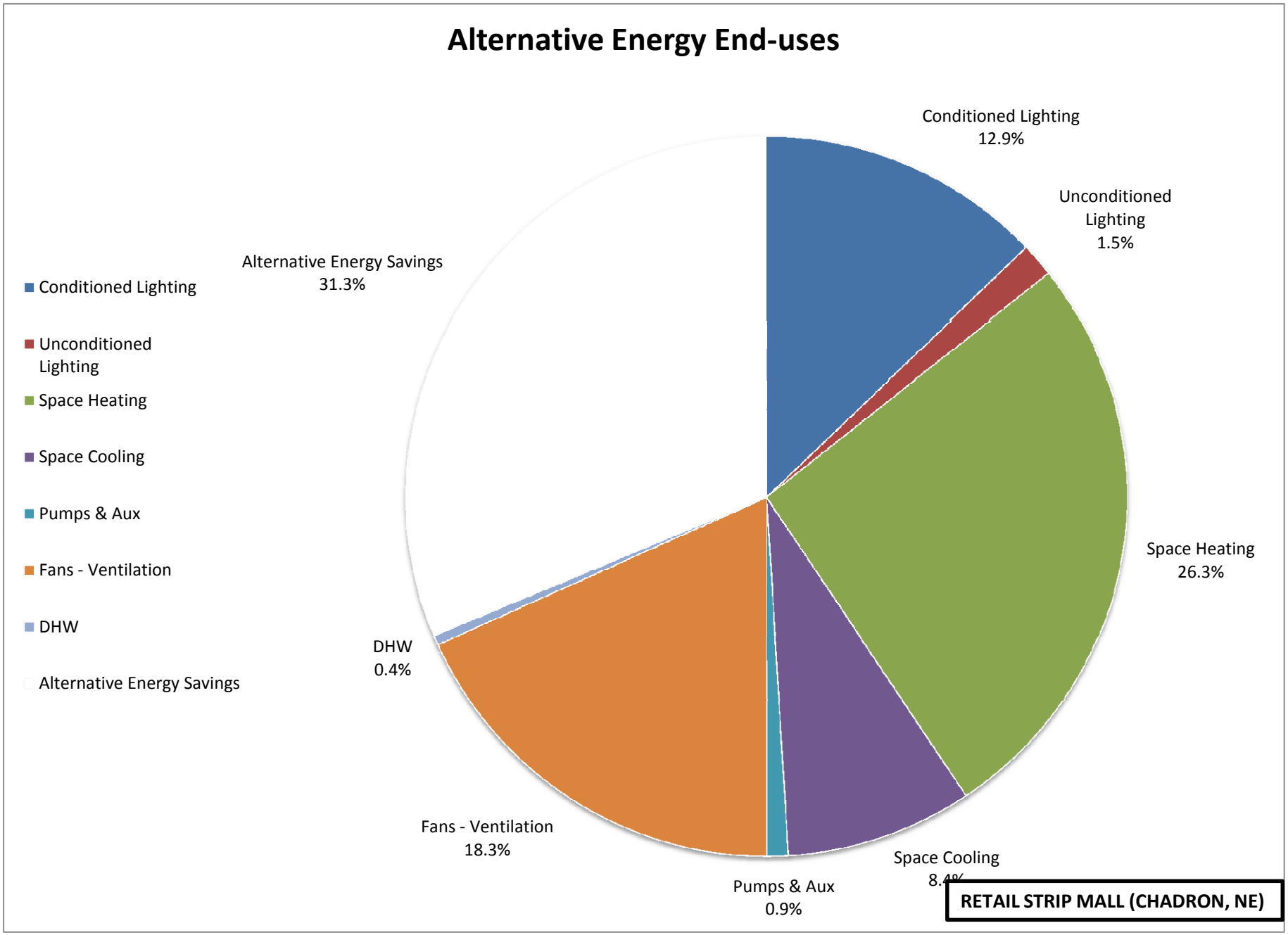
Building Energy Performance Summary - Base Case

End Use	*Energy Source*	*Baseline Building*		*Baseline Building +90*		*Baseline Building +180*		*Baseline Building +270*		Baseline Average		*% End Use of Baseline*
		Energy [MMbtu]	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	
Conditioned Lighting	Electricity	250.4	18.2	250.4	18.2	250.4	18.2	250.4	18.2	250.4	18.2	9.3%
Unconditioned Lighting	Electricity	29.4	0.0	29.4	0.0	29.4	0.0	29.4	0.0	29.4	0.0	1.1%
Misc Equipment	Electricity	735.4	53.3	735.4	49.9	735.4	53.3	735.4	49.9	735.4	51.6	27.4%
Space Heating	Electricity									0.0	0.0	0.0%
Space Heating	Gas	962.2	1.0	941.2	1.0	957.1	1.0	957.2	1.0	954.4	1.0	35.6%
Space Heating	Steam/ HW									0.0	0.0	0.0%
Space Cooling	Electricity	261.4	46.4	274.9	51.1	263.4	46.3	276.3	51.1	269.0	48.7	10.0%
Space Cooling	CHW									0.0	0.0	0.0%
Heat Rejection	Electricity									0.0	0.0	0.0%
Pumps & Aux	Electricity	12.7	0.0	12.6	0.0	12.7	0.0	12.5	0.0	12.6	0.0	0.5%
Fans - Ventilation	Electricity	412.8	19.6	432.5	20.3	412.6	19.4	438.1	20.5	424.0	20.0	15.8%
Fans - Exhaust	Electricity									0.0	0.0	0.0%
Refrigeration	Electricity									0.0	0.0	0.0%
HP Supplement	Electricity									0.0	0.0	0.0%
DHW	Elec									0.0	0.0	0.0%
DHW	Gas	8.6	0.0	8.6	0.0	8.6	0.0	8.6	0.0	8.6	0.0	0.3%
Total w/o Misc Equipment		1937.5		1949.6		1934.2		1972.5		1948.45		
Total w/ Misc Equipment		2672.9		2685.0		2669.6		2707.9		2683.85		

Energy Cost Summary

Energy Source	*Baseline Cost*	*Baseline Cost +90*	*Baseline Cost +180*	*Baseline Cost +270*	**Baseline Average**
Electricity*	$18,859	$19,525	$18,904	$19,643	**$19,232**
Gas	$8,407	$8,225	$8,362	$8,364	**$8,340**
Total	**$27,266**	**$27,750**	**$27,266**	**$28,007**	**$27,572**

*Electricity cost excludes Misc Equipment electrical consumption cost (based upon virtual rate)
DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms


Alternative Energy End-uses
Conditioned Lighting
12.9%
Unconditioned
Lighting
1.5%
Space Heating
26.3%
Space Cooling
8.4%
Pumps & Aux
0.9%
Fans - Ventilation
18.3%
DHW
0.4%
Alternative Energy Savings
31.3%
Conditioned Lighting
Unconditioned
Lighting
Space Heating
Space Cooling
Pumps & Aux
Fans - Ventilation
DHW
Alternative Energy Savings
RETAIL STRIP MALL (CHADRON, NE)

Retail Strip Mall Energy Results Summary
Chadron, NE

Description: Alternative
Packaged Rooftop; 90% eff. furnace; Energy Recovery Wheel; CEE Tier 1; Improved wall; and Solarban 70XL w/ thermally broken frame

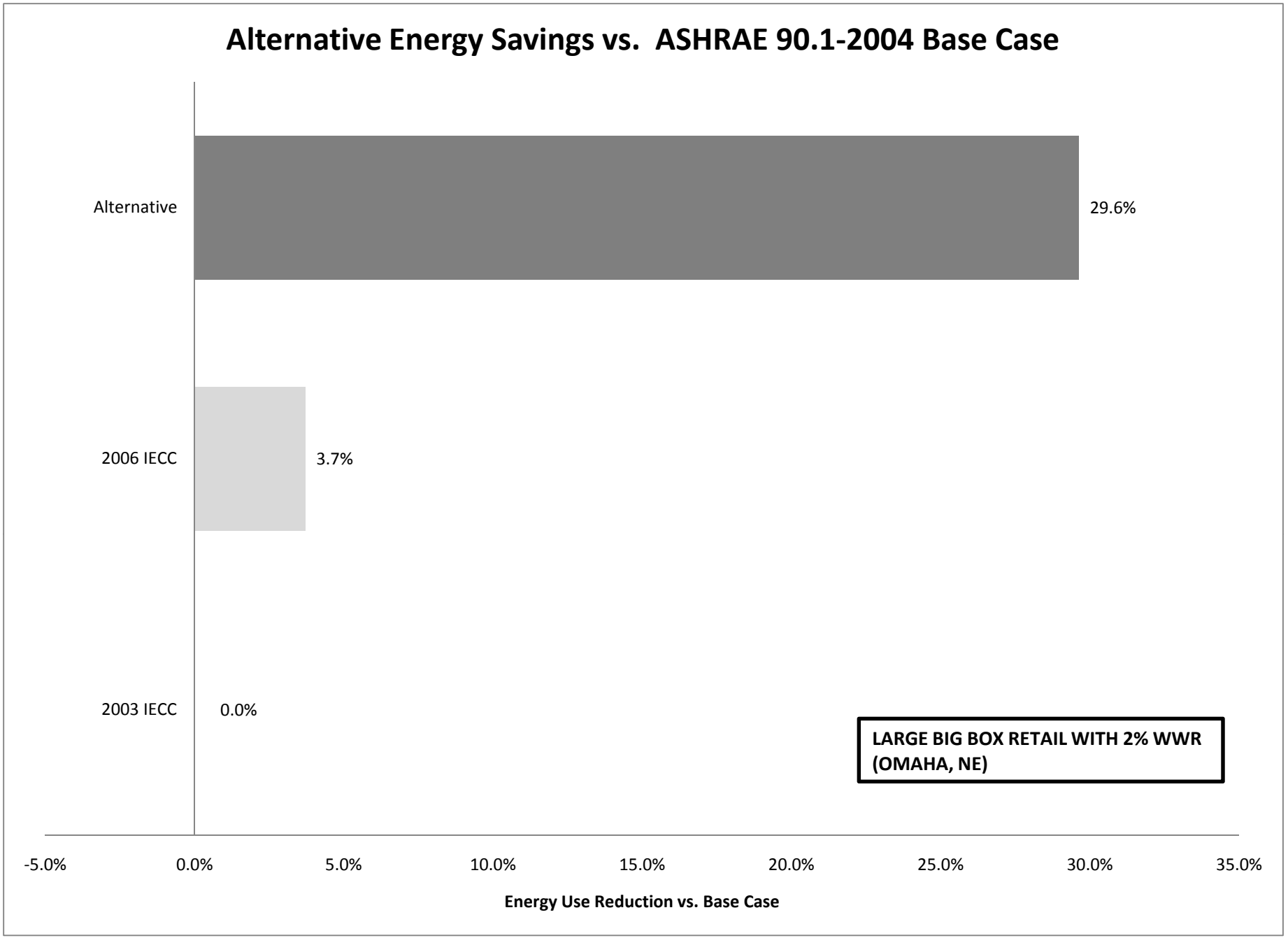
Building Energy Performance Summary

End Use	*Energy Source*	*Alternative Building*		*Average Baseline*		*Energy Difference Alt-Baseline*	*% of End Use of As Designed*	*Baseline Consumption Average*
		Energy [MMBtu]	*Peak [kW or therm/hr]*	*Energy [MMBtu]*	*Peak [kW or therm/hr]*	*[%]*	*[%]*	*[%]*
Conditioned Lighting	Electricity	250.4	18.2	250.4	18.2	0.0%	12.1%	9.3%
Unconditioned Lighting	Electricity	29.4	0.0	29.4	0.0	0.0%	1.4%	1.1%
Misc Equipment	Electricity	735.4	53.3	735.4	51.6	0.0%	35.5%	27.4%
Space Heating	Electricity			0.0	0.0		0.0%	0.0%
Space Heating	Gas	512.0	0.5	954.4	1.0	46.4%	24.7%	35.6%
Space Heating	Steam/ HW			0.0	0.0		0.0%	0.0%
Space Cooling	Elec	163.3	37.2	269.0	48.7	39.3%	7.9%	10.0%
Space Cooling	Chilled Water			0.0	0.0		0.0%	0.0%
Heat Rejection	Electricity			0.0	0.0		0.0%	0.0%
Pumps & Aux	Electricity	18.4	0.4	12.6	0.0	-45.7%	0.9%	0.5%
Fans - Ventilation	Electricity	356.5	20.0	424.0	20.0	15.9%	17.2%	15.8%
Fans - Exhaust	Electricity			0.0	0.0		0.0%	0.0%
Refrigeration	Electricity			0.0	0.0		0.0%	0.0%
HP Supplement	Electricity			0.0	0.0		0.0%	0.0%
DHW	Elec			0.0	0.0		0.0%	0.0%
DHW	Gas	8.5	0.0	8.6	0.0	1.2%	0.4%	0.3%
Total w/o Misc Equipment		**1338.5**		**1948.5**		**31.3%**	100.0%	100.0%
Alternative Energy Savings		**610.0**						
Total w/ Misc Equipment		2073.9		2683.9				

Energy Cost Summary

Energy Source	*As Designed Cost*	*Baseline Cost*
Electricity*	$15,991	$19,232
Gas	$4,508	$8,340
Total	$20,499	$27,572

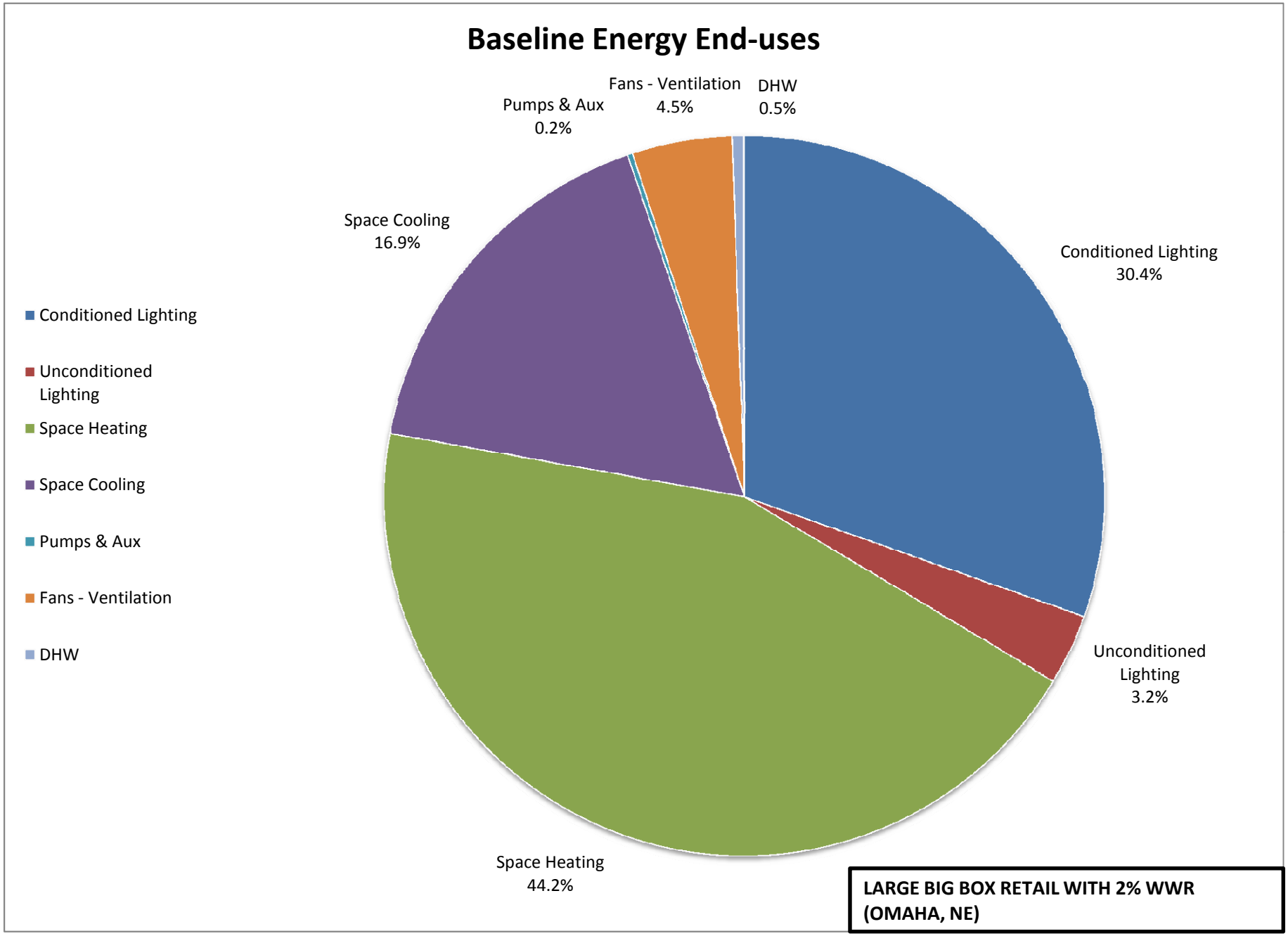
*Electricity cost excludes Misc Equipment electrical consumption cost (based upon virtual rate)
DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms


Alternative Energy Savings vs. ASHRAE 90.1-2004 Base Case
Alternative
29.6%
2006 IECC
3.7%
2003 IECC
0.0%
LARGE BIG BOX RETAIL WITH 2% WWR (OMAHA, NE)
-5.0%
0.0%
5.0%
10.0%
15.0%
20.0%
25.0%
30.0%
35.0%
Energy Use Reduction vs. Base Case

Big Box Retail 2% WWR Energy Results Summary
Omaha, NE

Run	Name	Annual Energy Use* [MMBtu]	Annual Energy Cost* [$]	Cost Savings vs. Avg. Base* [$]	Savings vs Avg. Base* [%]	Energy Use Reduction vs. Base* [MMBtu]	Energy Use Reduction vs. Base* [%]	Notes
0.00	Base Case	6849.9	$99,889					
	Base +90°	6893.4	$100,349					ASHRAE 90.1-2004 Baseline Appendix G
	Base +180°	6854.9	$99,937					Walls: U-0.084; Roof: U-0.063;
	Base +270°	6840.1	$99,881					Floors - U-0.052;
	Avg Base Case	6859.6	$100,014					Windows: U-0.57, SHGC-0.39
1.10	2003 IECC	6861.1	$100,085	-$71	-0.1%	-1.53	0.0%	1.10: 2003 IECC (Omaha 13b)
1.11	2006 IECC	6605.1	$97,551	$2,463	2.5%	254.48	3.7%	1.11: 2006 IECC
3.51	Alternative	4827.7	$89,166	$10,848	10.8%	2031.88	29.6%	Drybulb economizer; Dedicated ERV w/enthalpy wheel; CEE Tier 1 cooling equipment efficiencies; R-19+7.5 ci wall; R-30 roof; Solarban 70XL w/ thermally broken frame; Insulated dock doors

*Reported value excludes Misc Equipment electrical end-use


Baseline Energy End-uses
Fans - Ventilation
4.5%
DHW
0.5%
Pumps & Aux
0.2%
Space Cooling
16.9%
Conditioned Lighting
30.4%
Unconditioned
Lighting
3.2%
Space Heating
44.2%
Conditioned Lighting
Unconditioned
Lighting
Space Heating
Space Cooling
Pumps & Aux
Fans - Ventilation
DHW
LARGE BIG BOX RETAIL WITH 2% WWR
(OMAHA, NE)

Big Box Retail 2% WWR Energy Results Summary
Omaha, NE

Building Energy Performance Summary - Base Case

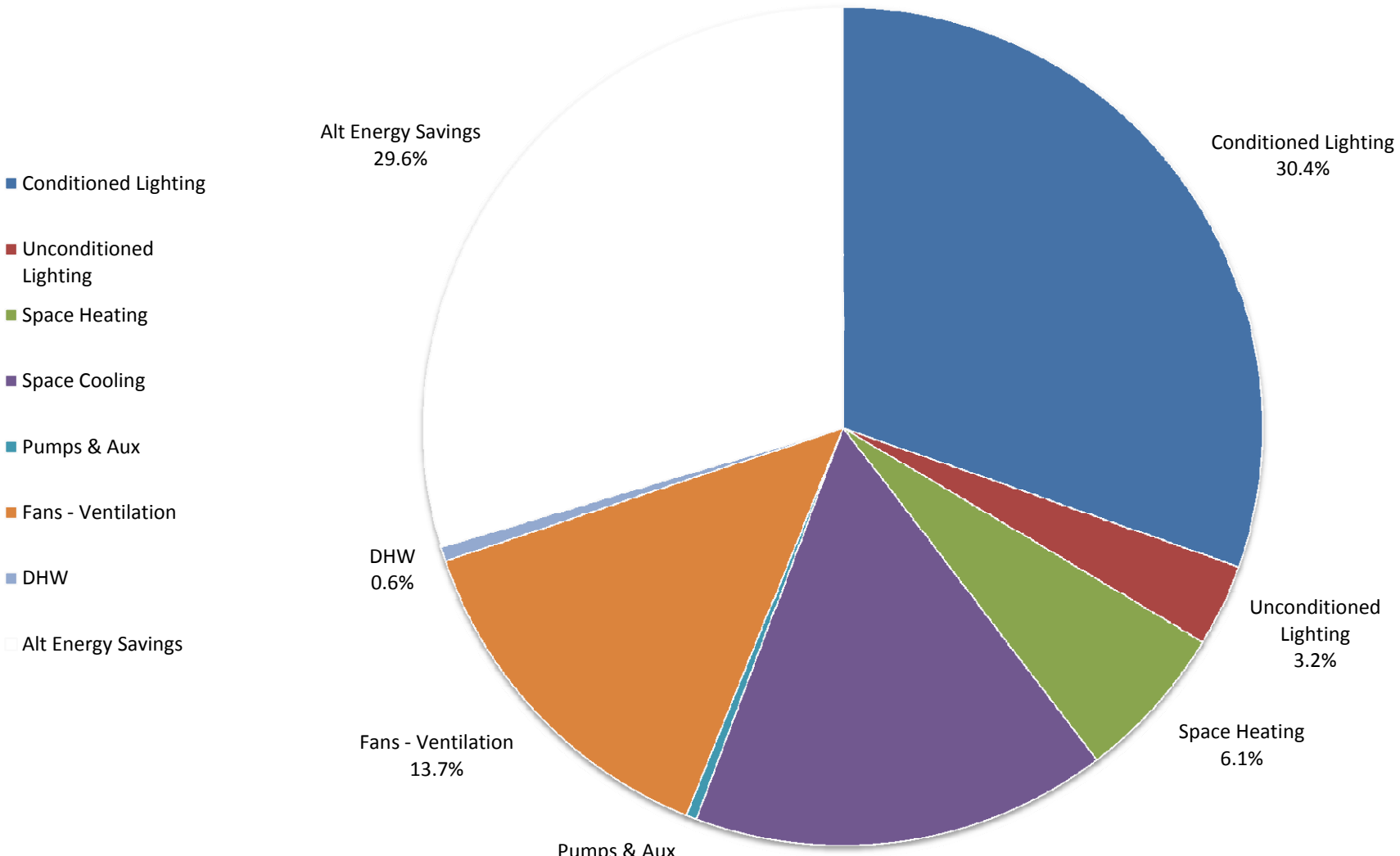
End Use	*Energy Source*	*Baseline Building*		*Baseline Building +90*		*Baseline Building +180*		*Baseline Building +270*		Baseline Average		*% End Use of Baseline*
		Energy [MMbtu]	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	
Conditioned Lighting	Electricity	2086.3	153.0	2086.3	153.0	2086.3	153.0	2086.3	153.0	2086.3	153.0	22.6%
Unconditioned Lighting	Electricity	217.7	18.0	217.7	18.0	217.7	18.0	217.7	18.0	217.7	18.0	2.4%
Misc Equipment	Electricity	2380.9	174.6	2380.9	174.6	2380.9	174.6	2380.9	174.6	2380.9	174.6	25.8%
Space Heating	Electricity									0.0	0.0	0.0%
Space Heating	Gas	3024.4	59.0	3066.7	59.5	3030.7	59.5	3013.2	59.6	3033.8	59.4	32.8%
Space Heating	Steam/ HW									0.0	0.0	0.0%
Space Cooling	Electricity	1161.8	384.8	1161.0	385.5	1160.4	385.0	1163.2	385.8	1161.6	385.3	12.6%
Space Cooling	CHW									0.0	0.0	0.0%
Heat Rejection	Electricity									0.0	0.0	0.0%
Pumps & Aux	Electricity	15.7	2.2	16.4	2.2	15.5	2.2	15.2	2.2	15.7	2.2	0.2%
Fans - Ventilation	Electricity	307.8	77.1	309.1	77.1	308.1	77.6	308.3	77.4	308.3	77.3	3.3%
Fans - Exhaust	Electricity									0.0	0.0	0.0%
Refrigeration	Electricity									0.0	0.0	0.0%
HP Supplement	Electricity									0.0	0.0	0.0%
DHW	Elec									0.0	0.0	0.0%
DHW	Gas	36.2	0.1	36.2	0.1	36.2	0.1	36.2	0.1	36.2	0.1	0.4%
Total w/o Misc Equipment		6849.9		6893.4		6854.9		6840.1		6859.6		
Total w/ Misc Equipment		9230.8		9274.3		9235.8		9221.0		9240.5		

Energy Cost Summary

Energy Source	*Baseline Cost*	*Baseline Cost +90*	*Baseline Cost +180*	*Baseline Cost +270*	**Baseline Average**
Electricity*	$71,251	$71,324	$71,240	$71,346	**$71,291**
Gas	$28,638	$29,025	$28,697	$28,535	**$28,724**
Steam/ HW					**$0**
Chilled Water					**$0**
Total	**$99,889**	**$100,349**	**$99,937**	**$99,881**	**$100,014**

*Electricity cost excludes Misc Equipment electrical consumption cost (based upon virtual rate)
DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms

30% Alternative Energy End-uses



LARGE BIG BOX RETAIL WITH 2% WWR (OMAHA, NE)

Big Box Retail 2% WWR Energy Results Summary
Omaha, NE

Description: Drybulb economizer; Dedicated ERV w/enthalpy wheel; CEE Tier 1 cooling equipment efficiencies; R-19+7.5 ci wall; R-30 roof; Solarban 70XL w/ thermally broken frame; Insulated dock doors

Building Energy Performance Summary

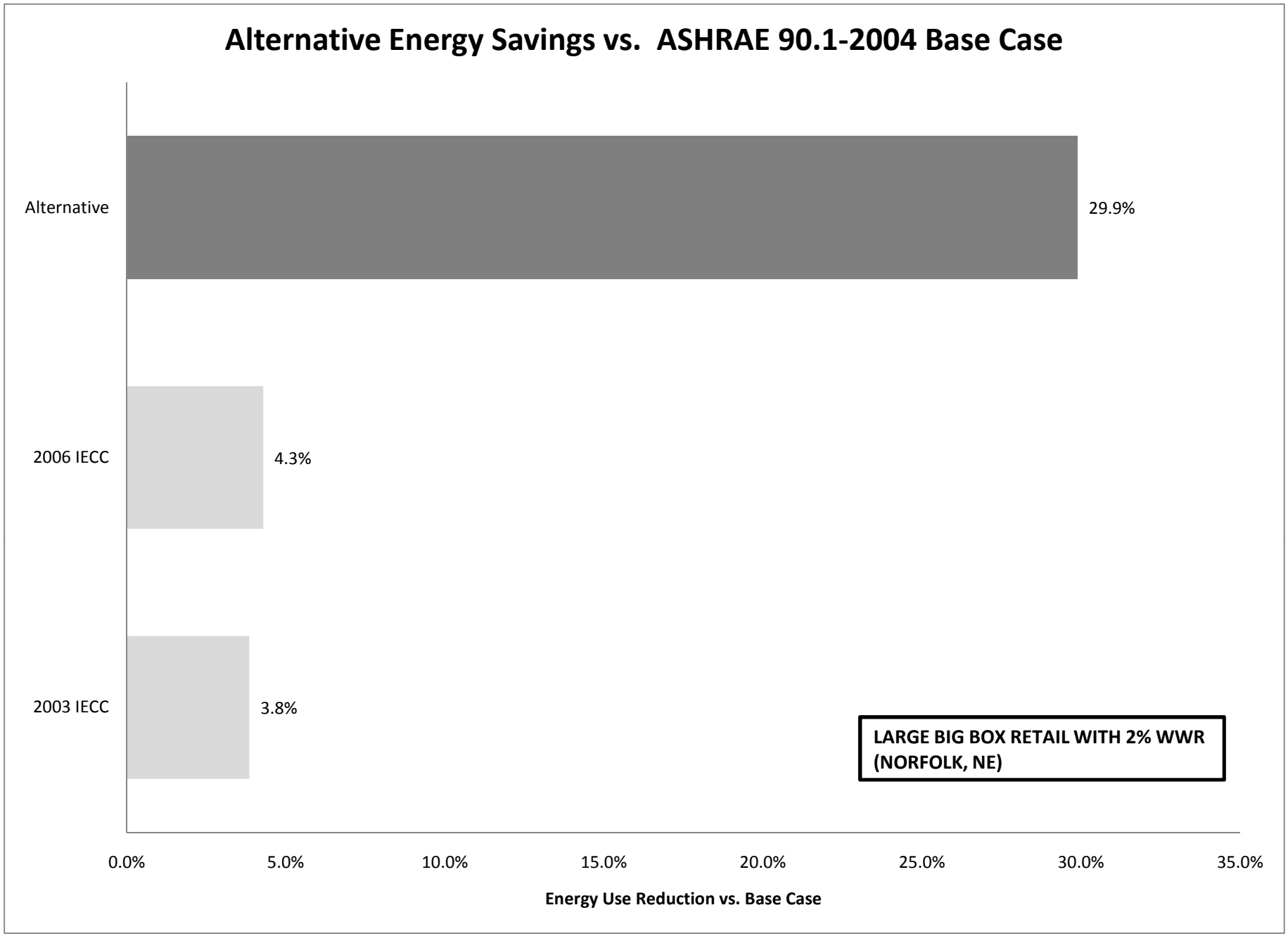
End Use	*Energy Source*	*Alternative Building*		*Average Baseline*		*Energy Difference Alt-Baseline*	*% of End Use of As Designed*	*Baseline Consumption Average*
		Energy [MMBtu]	*Peak [kW or therm/hr]*	*Energy [MMBtu]*	*Peak [kW or therm/hr]*	*[%]*	*[%]*	*[%]*
Conditioned Lighting	Electricity	2086.3	153.0	2086.3	153.0	0.0%	28.9%	22.6%
Unconditioned Lighting	Electricity	217.7	18.0	217.7	18.0	0.0%	3.0%	2.4%
Misc Equipment	Electricity	2380.9	174.6	2380.9	174.6	0.0%	33.0%	25.8%
Space Heating	Electricity			0.0	0.0		0.0%	0.0%
Space Heating	Gas	415.4	18.7	3033.8	59.4	86.3%	5.8%	32.8%
Space Heating	Steam/ HW			0.0	0.0		0.0%	0.0%
Space Cooling	Elec	1099.9	218.4	1161.6	385.3	5.3%	15.3%	12.6%
Space Cooling	Chilled Water			0.0	0.0		0.0%	0.0%
Heat Rejection	Electricity			0.0	0.0		0.0%	0.0%
Pumps & Aux	Electricity	27.8	2.8	15.7	2.2	-77.1%	0.4%	0.2%
Fans - Ventilation	Electricity	942.2	62.7	308.3	77.3	-205.6%	13.1%	3.3%
Fans - Exhaust	Electricity			0.0	0.0		0.0%	0.0%
Refrigeration	Electricity			0.0	0.0		0.0%	0.0%
HP Supplement	Electricity			0.0	0.0		0.0%	0.0%
DHW	Elec			0.0	0.0		0.0%	0.0%
DHW	Gas	38.4	0.1	36.2	0.1	-6.1%	0.5%	0.4%
Total w/o Misc Equipment		**4827.7**		**6859.6**		**29.6%**	100.0%	100.0%
Alt Energy Savings		**2031.9**						
Total w/ Misc Equipment		7208.6		9240.5		22.0%		

Energy Cost Summary

Energy Source	*As Designed Cost*	*Baseline Cost*
Electricity*	$84,826	$71,291
Gas	$4,340	$28,724
Steam/ HW		$0
Chilled Water		$0
Total	**$89,166**	**$100,014**

*Electricity cost excludes Misc Equipment electrical consumption cost (based upon virtual rate)

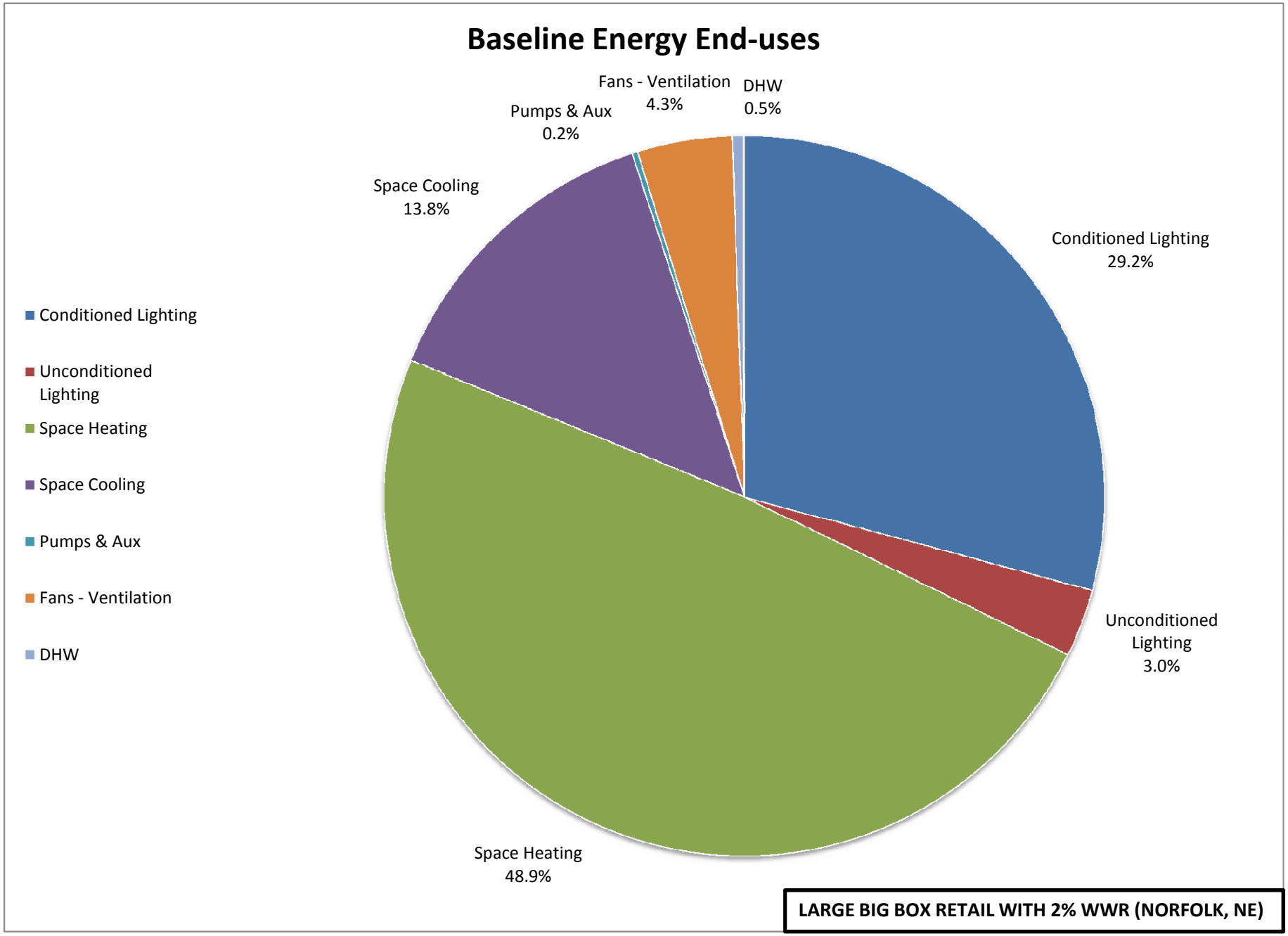
DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms


Alternative Energy Savings vs. ASHRAE 90.1-2004 Base Case
Alternative
29.9%
2006 IECC
4.3%
2003 IECC
3.8%
LARGE BIG BOX RETAIL WITH 2% WWR
(NORFOLK, NE)
0.0%
5.0%
10.0%
15.0%
20.0%
25.0%
30.0%
35.0%
Energy Use Reduction vs. Base Case

Big Box Retail 2% WWR Energy Results Summary
Norfolk, NE

Run	Name	Annual Energy Use* [MMBtu]	Annual Energy Cost* [$]	Cost Savings vs. Avg. Base* [$]	Savings vs Avg. Base* [%]	Energy Use Reduction vs. Base* [MMBtu]	Energy Use Reduction vs. Base* [%]	Notes
0.00	Base Case	7143.9	$100,326					
	Base +90°	7168	$100,537					ASHRAE 90.1-2004 Baseline Appendix G
	Base +180°	7141.1	$100,293					
	Base +270°	7126	$100,194					Walls: U-0.084; Roof: U-0.063; Floors - U-0.052;
	Avg Base Case	7144.8	$100,337					Windows: U-0.57, SHGC-0.39
1.10	2003 IECC	6869.8	$98,074	$2,264	2.3%	274.95	3.8%	1.10: 2003 IECC (Norfolk 14b)
1.11	2006 IECC	6838.1	$99,918	$419	0.4%	306.65	4.3%	1.11: 2006 IECC
3.51	Alternative	5009.3	$91,563	$8,774	8.7%	2135.45	29.9%	Drybulb economizer; Dedicated ERV w/enthalpy wheel; CEE Tier 1 cooling equipment efficiencies; R-19+7.5 ci wall; R-30 roof; Solarban 70XL w/ thermally broken frame; Insulated dock doors

*Reported value excludes Misc Equipment electrical end-use


Baseline Energy End-uses
Fans - Ventilation
4.3%
DHW
0.5%
Pumps & Aux
0.2%
Space Cooling
13.8%
Conditioned Lighting
29.2%
Unconditioned
Lighting
3.0%
Space Heating
48.9%
Conditioned Lighting
Unconditioned
Lighting
Space Heating
Space Cooling
Pumps & Aux
Fans - Ventilation
DHW
LARGE BIG BOX RETAIL WITH 2% WWR (NORFOLK, NE)

Big Box Retail 2% WWR Energy Results Summary
Norfolk, NE

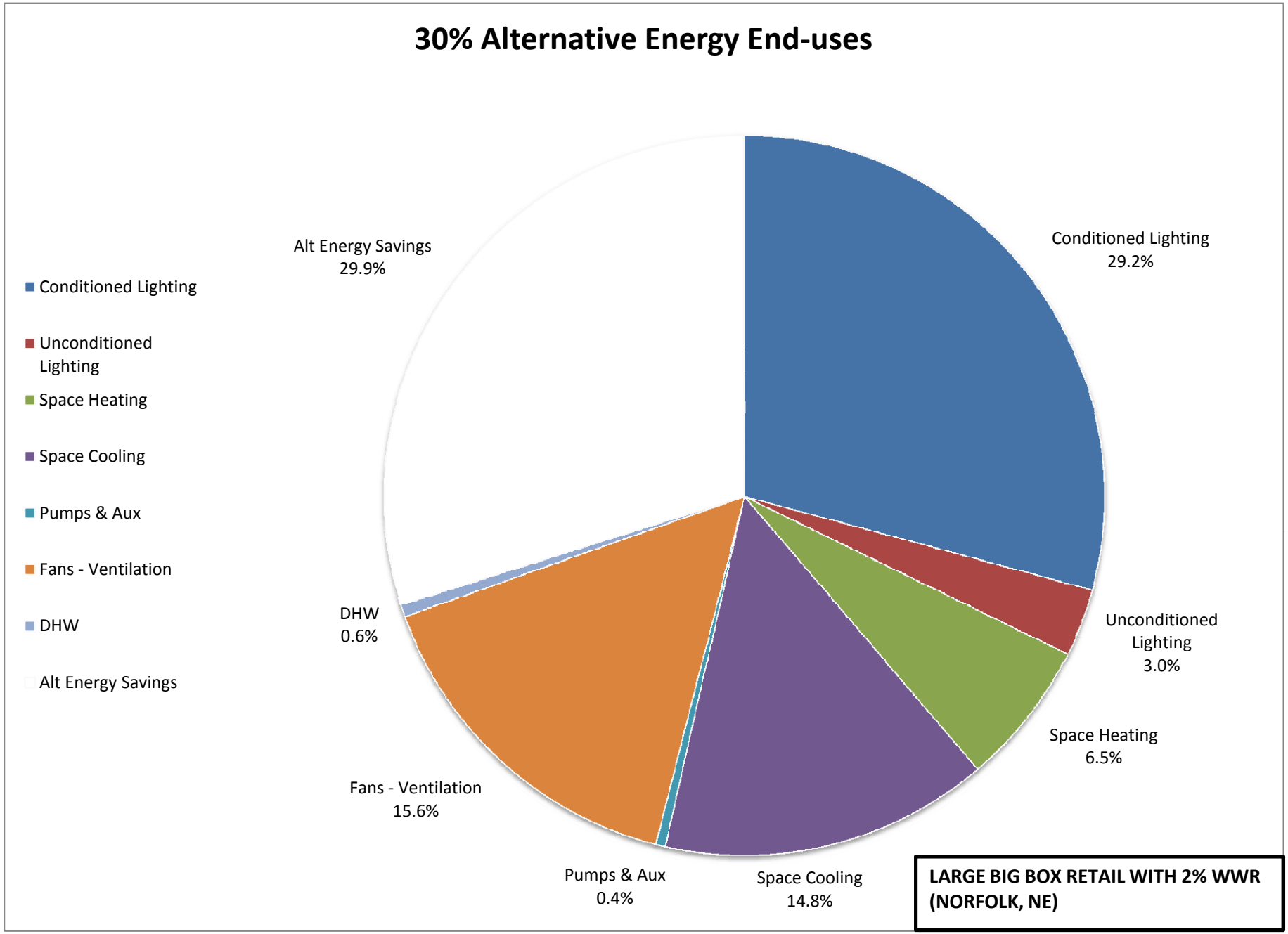
Building Energy Performance Summary - Base Case

End Use	*Energy Source*	*Baseline Building*		*Baseline Building +90*		*Baseline Building +180*		*Baseline Building +270*		Baseline Average		*% End Use of Baseline*
		Energy [MMbtu]	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	
Conditioned Lighting	Electricity	2086.3	153.0	2086.3	153.0	2086.3	153.0	2086.3	153.0	2086.3	153.0	21.9%
Unconditioned Lighting	Electricity	217.7	18.0	217.7	18.0	217.7	18.0	217.7	18.0	217.7	18.0	2.3%
Misc Equipment	Electricity	2380.9	174.6	2380.9	174.6	2380.9	174.6	2380.9	174.6	2380.9	174.6	25.0%
Space Heating	Electricity									0.0	0.0	0.0%
Space Heating	Gas	3495.3	57.6	3518.2	57.6	3493.0	57.6	3476.5	57.6	3495.8	57.6	36.7%
Space Heating	Steam/ HW									0.0	0.0	0.0%
Space Cooling	Electricity	984.9	329.6	985.0	329.3	984.7	328.7	986.2	329.5	985.2	329.3	10.3%
Space Cooling	CHW									0.0	0.0	0.0%
Heat Rejection	Electricity									0.0	0.0	0.0%
Pumps & Aux	Electricity	17.7	2.2	18.5	2.2	17.6	2.2	17.2	2.2	17.8	2.2	0.2%
Fans - Ventilation	Electricity	304.8	72.5	305.1	72.4	304.6	72.4	304.9	72.4	304.9	72.4	3.2%
Fans - Exhaust	Electricity									0.0	0.0	0.0%
Refrigeration	Electricity									0.0	0.0	0.0%
HP Supplement	Electricity									0.0	0.0	0.0%
DHW	Elec									0.0	0.0	0.0%
DHW	Gas	37.2	0.1	37.2	0.1	37.2	0.1	37.2	0.1	37.2	0.1	0.4%
Total w/o Misc Equipment		7143.9		7168.0		7141.1		7126.0		7144.8		
Total w/ Misc Equipment		9524.8		9548.9		9522.0		9506.9		9525.7		

Energy Cost Summary

Energy Source	*Baseline Cost*	*Baseline Cost +90*	*Baseline Cost +180*	*Baseline Cost +270*	**Baseline Average**
Electricity*	$70,954	$70,976	$70,940	$70,978	**$70,962**
Gas	$29,372	$29,561	$29,353	$29,216	**$29,376**
Steam/ HW					**$0**
Chilled Water					**$0**
Total	**$100,326**	**$100,537**	**$100,293**	**$100,194**	**$100,337**

*Electricity cost excludes Misc Equipment electrical consumption cost (based upon virtual rate)
DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms


30% Alternative Energy End-uses
Conditioned Lighting
Unconditioned Lighting
Space Heating
Space Cooling
Pumps & Aux
Fans - Ventilation
DHW
Alt Energy Savings
Alt Energy Savings 29.9%
Conditioned Lighting 29.2%
Unconditioned Lighting 3.0%
Space Heating 6.5%
Space Cooling 14.8%
Pumps & Aux 0.4%
Fans - Ventilation 15.6%
DHW 0.6%
LARGE BIG BOX RETAIL WITH 2% WWR (NORFOLK, NE)

Big Box Retail 2% WWR Energy Results Summary
Norfolk, NE

Description: Drybulb economizer; Dedicated ERV w/enthalpy wheel; CEE Tier 1 cooling equipment efficiencies; R-19+7.5 ci wall; R-30 roof; Solarban 70XL w/ thermally broken frame; Insulated dock doors

Building Energy Performance Summary

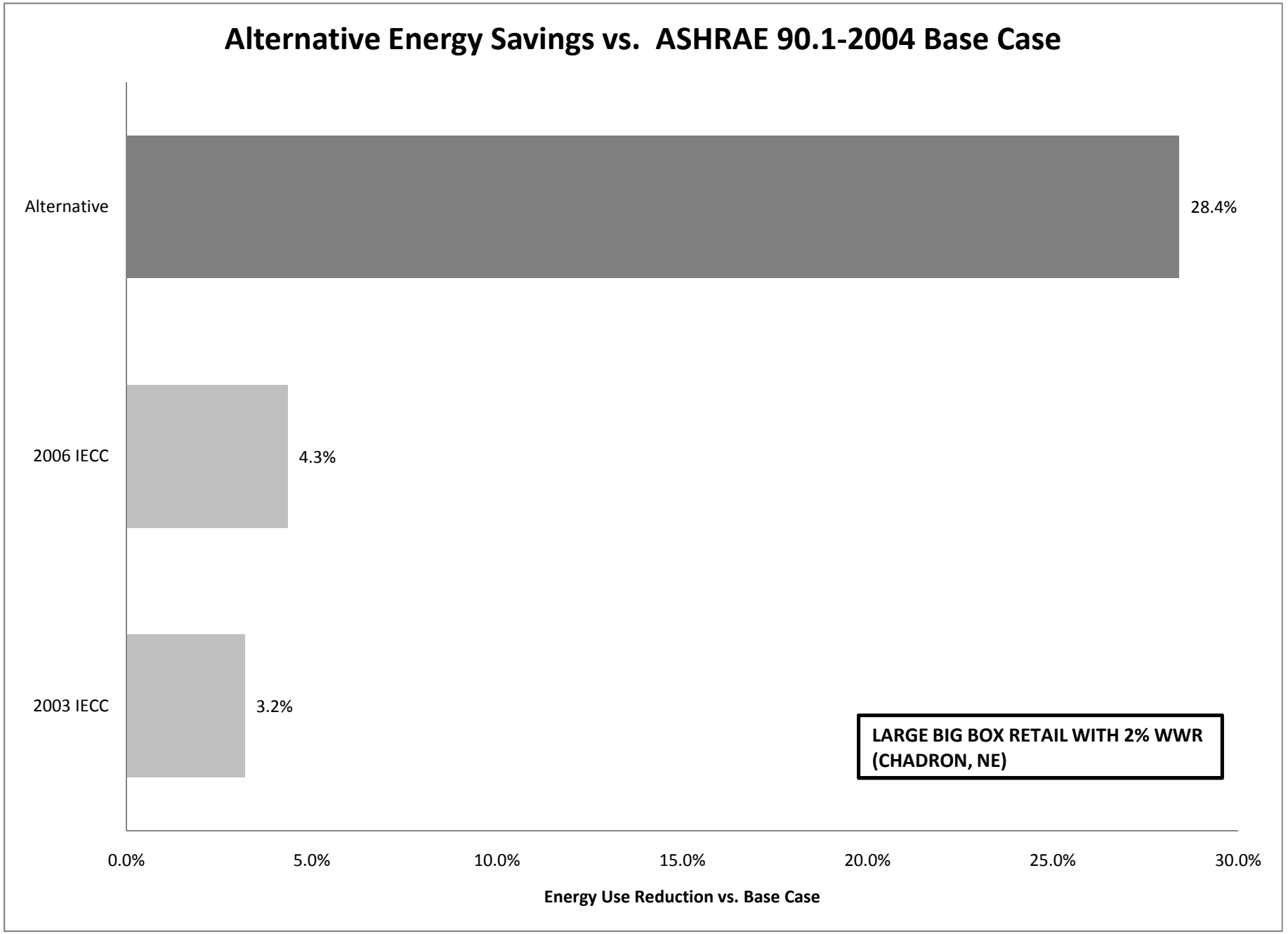
End Use	*Energy Source*	*Alternative Building*		*Average Baseline*		*Energy Difference Alt-Baseline*	*% of End Use of As Designed*	*Baseline Consumption Average*
		Energy [MMBtu]	*Peak [kW or therm/hr]*	*Energy [MMBtu]*	*Peak [kW or therm/hr]*	*[%]*	*[%]*	*[%]*
Conditioned Lighting	Electricity	2086.3	153.0	2086.3	153.0	0.0%	28.2%	21.9%
Unconditioned Lighting	Electricity	217.7	18.0	217.7	18.0	0.0%	2.9%	2.3%
Misc Equipment	Electricity	2380.9	174.6	2380.9	174.6	0.0%	32.2%	25.0%
Space Heating	Electricity			0.0	0.0		0.0%	0.0%
Space Heating	Gas	465.5	20.9	3495.8	57.6	86.7%	6.3%	36.7%
Space Heating	Steam/ HW			0.0	0.0		0.0%	0.0%
Space Cooling	Elec	1054.1	207.6	985.2	329.3	-7.0%	14.3%	10.3%
Space Cooling	Chilled Water			0.0	0.0		0.0%	0.0%
Heat Rejection	Electricity			0.0	0.0		0.0%	0.0%
Pumps & Aux	Electricity	30.6	2.9	17.8	2.2	-72.4%	0.4%	0.2%
Fans - Ventilation	Electricity	1115.7	73.1	304.9	72.4	-266.0%	15.1%	3.2%
Fans - Exhaust	Electricity			0.0	0.0		0.0%	0.0%
Refrigeration	Electricity			0.0	0.0		0.0%	0.0%
HP Supplement	Electricity			0.0	0.0		0.0%	0.0%
DHW	Elec			0.0	0.0		0.0%	0.0%
DHW	Gas	39.4	0.1	37.2	0.1	-5.9%	0.5%	0.4%
Total w/o Misc Equipment		**5009.3**		**7144.8**		**29.9%**	100.0%	100.0%
Alt Energy Savings		**2135.5**						
Total w/ Misc Equipment		7390.2		9525.7		22.4%		

Energy Cost Summary

Energy Source	*As Designed Cost*	*Baseline Cost*
Electricity*	$87,190	$70,962
Gas	$4,373	$29,376
Steam/ HW		$0
Chilled Water		$0
Total	**$91,563**	**$100,337**

*Electricity cost excludes Misc Equipment electrical consumption cost (based upon virtual rate)

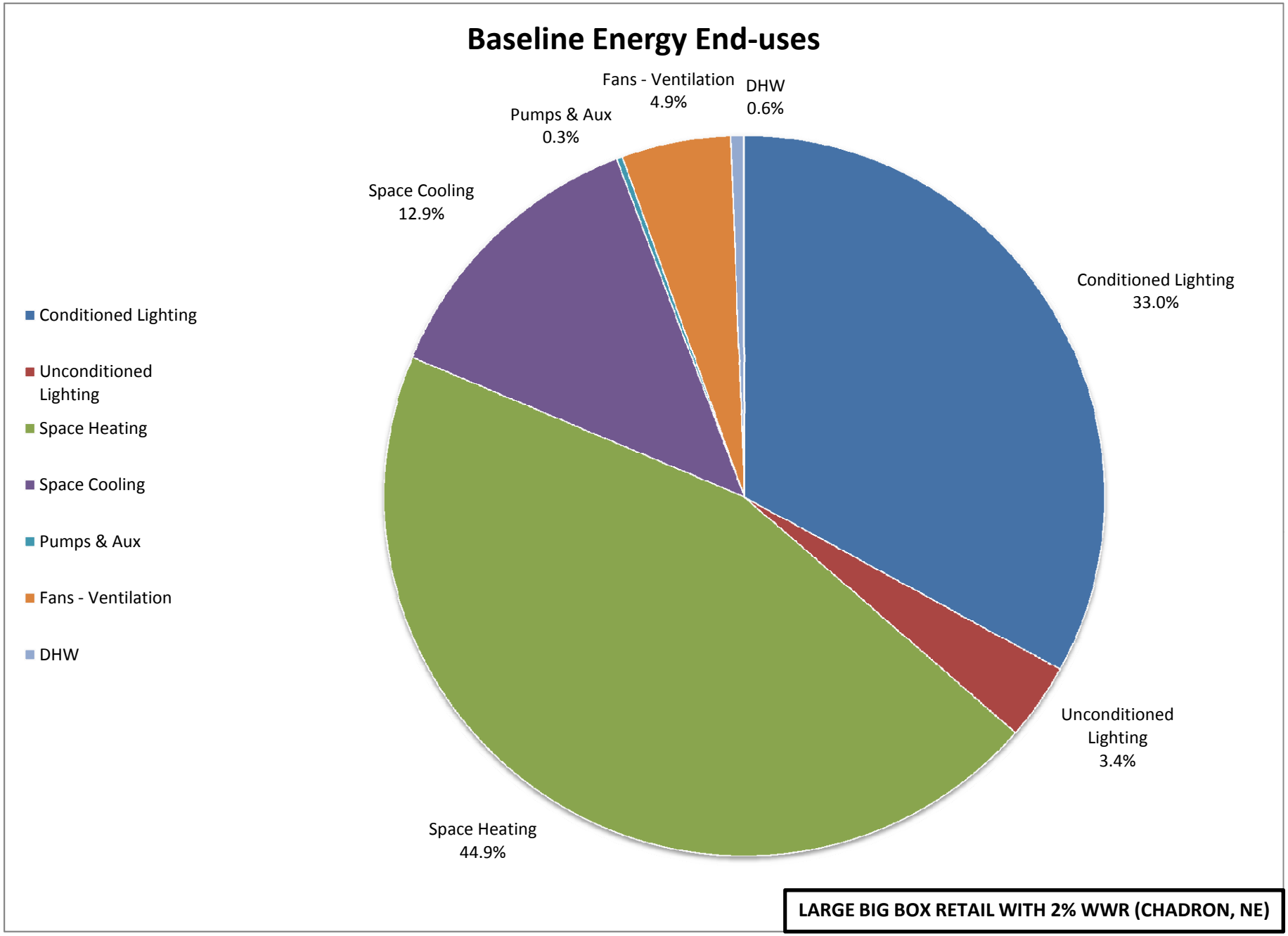
DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms


Alternative Energy Savings vs. ASHRAE 90.1-2004 Base Case
Alternative
28.4%
2006 IECC
4.3%
2003 IECC
3.2%
LARGE BIG BOX RETAIL WITH 2% WWR
(CHADRON, NE)
0.0%
5.0%
10.0%
15.0%
20.0%
25.0%
30.0%
Energy Use Reduction vs. Base Case

Big Box Retail 2% WWR Energy Results Summary
Chadron, NE

Run	Name	Annual Energy Use* [MMBtu]	Annual Energy Cost* [$]	Cost Savings vs. Avg. Base* [$]	Savings vs Avg. Base* [%]	Energy Use Reduction vs. Base* [MMBtu]	Energy Use Reduction vs. Base* [%]	Notes
0.00	Base Case	6327.4	$92,443					
	Base +90°	6356.9	$92,724					ASHRAE 90.1-2004 Baseline Appendix G
	Base +180°	6308.5	$92,274					Walls: U-0.084; Roof: U-0.063;
	Base +270°	6301.8	$92,252					Floors - U-0.052;
	Avg Base Case	6323.7	$92,424					Windows: U-0.57, SHGC-0.39
1.10	2003 IECC	6121.7	$90,636	$1,787	1.9%	201.95	3.2%	1.10: 2003 IECC (Chadron 15)
1.11	2006 IECC	6048.6	$89,855	$2,568	2.8%	275.05	4.3%	1.11: 2006 IECC
3.51	Alternative	4526.9	$84,081	$8,342	9.0%	1796.75	28.4%	Drybulb Economizer; Dedicated ERV w/enthalpy wheel; CEE Tier 1 cooling equipment efficiencies; R-19+7.5 ci wall; R-30 roof; Solarban 70XL w/ thermally broken frame; Insulated dock doors

*Reported value excludes Misc Equipment electrical end-use


Baseline Energy End-uses
Conditioned Lighting
Unconditioned Lighting
Space Heating
Space Cooling
Pumps & Aux
Fans - Ventilation
DHW
Conditioned Lighting 33.0%
Unconditioned Lighting 3.4%
Space Heating 44.9%
Space Cooling 12.9%
Pumps & Aux 0.3%
Fans - Ventilation 4.9%
DHW 0.6%
LARGE BIG BOX RETAIL WITH 2% WWR (CHADRON, NE)

Big Box Retail 2% WWR Energy Results Summary
Chadron, NE

Building Energy Performance Summary - Base Case

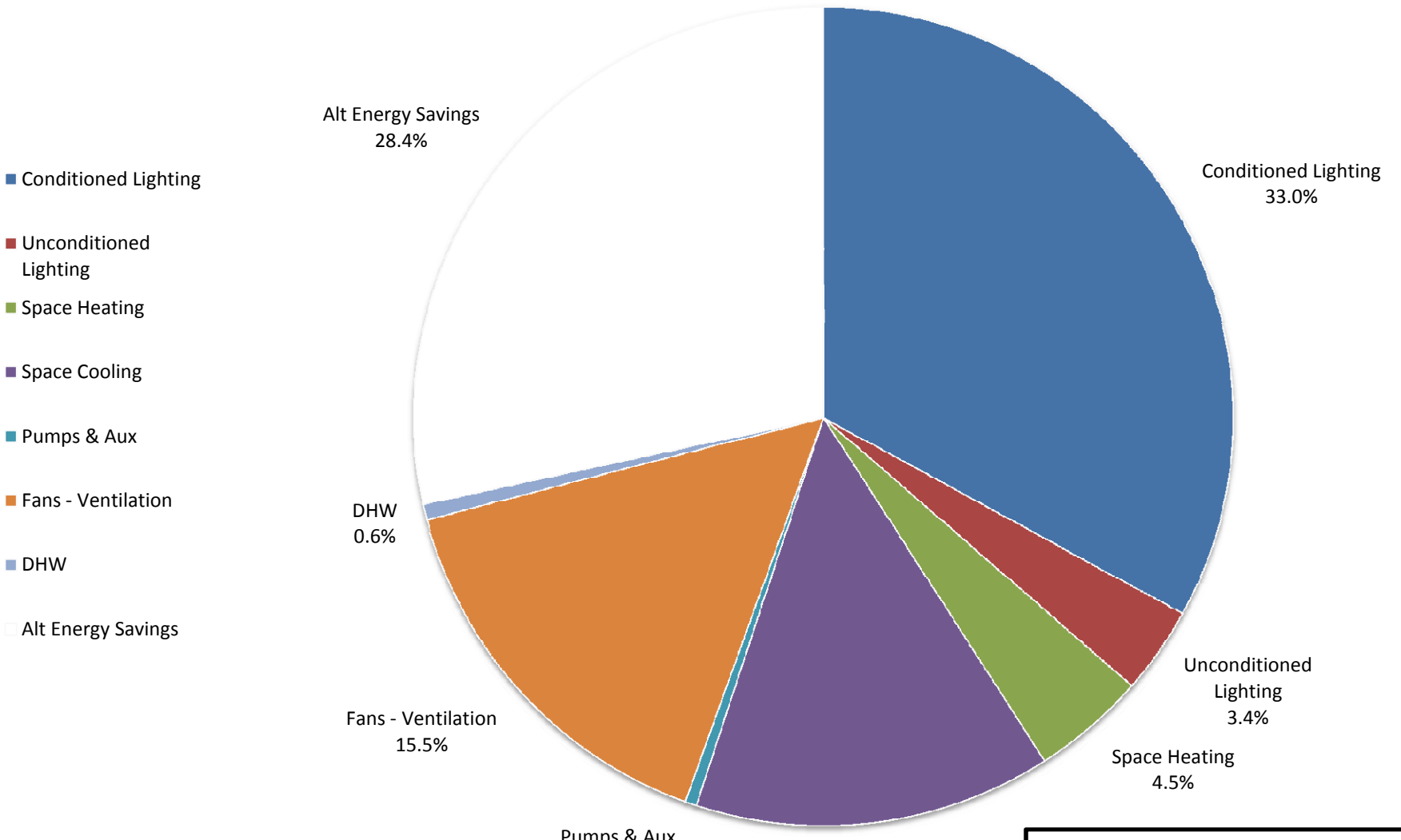
End Use	*Energy Source*	*Baseline Building*		*Baseline Building +90*		*Baseline Building +180*		*Baseline Building +270*		Baseline Average		*% End Use of Baseline*
		Energy [MMbtu]	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	
Conditioned Lighting	Electricity	2086.3	153.0	2086.3	153.0	2086.3	153.0	2086.3	153.0	2086.3	153.0	24.0%
Unconditioned Lighting	Electricity	217.7	18.0	217.7	18.0	217.7	18.0	217.7	18.0	217.7	18.0	2.5%
Misc Equipment	Electricity	2380.9	174.6	2380.9	174.6	2380.9	174.6	2380.9	174.6	2380.9	174.6	27.4%
Space Heating	Electricity									0.0	0.0	0.0%
Space Heating	Gas	2843.1	56.6	2870.1	57.9	2824.5	57.8	2815.7	56.6	2838.4	57.2	32.6%
Space Heating	Steam/ HW									0.0	0.0	0.0%
Space Cooling	Electricity	816.3	261.1	817.2	261.2	815.9	260.5	818.3	262.1	816.9	261.2	9.4%
Space Cooling	CHW									0.0	0.0	0.0%
Heat Rejection	Electricity									0.0	0.0	0.0%
Pumps & Aux	Electricity	16.8	2.1	17.6	2.1	16.5	2.1	16.2	2.1	16.8	2.1	0.2%
Fans - Ventilation	Electricity	310.0	74.7	310.8	76.3	310.4	76.0	310.4	75.5	310.4	75.6	3.6%
Fans - Exhaust	Electricity									0.0	0.0	0.0%
Refrigeration	Electricity									0.0	0.0	0.0%
HP Supplement	Electricity									0.0	0.0	0.0%
DHW	Elec									0.0	0.0	0.0%
DHW	Gas	37.2	0.1	37.2	0.1	37.2	0.1	37.2	0.1	37.2	0.1	0.4%
Total w/o Misc Equipment		6327.4		6356.9		6308.5		6301.8		6323.7		
Total w/ Misc Equipment		8708.3		8737.8		8689.4		8682.7		8704.6		

Energy Cost Summary

Energy Source	*Baseline Cost*	*Baseline Cost +90*	*Baseline Cost +180*	*Baseline Cost +270*	**Baseline Average**
Electricity*	$67,499	$67,547	$67,492	$67,545	**$67,521**
Gas	$24,944	$25,177	$24,782	$24,707	**$24,903**
Steam/ HW					**$0**
Chilled Water					**$0**
Total	**$92,443**	**$92,724**	**$92,274**	**$92,252**	**$92,424**

*Electricity cost excludes Misc Equipment electrical consumption cost (based upon virtual rate)
DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms

30% Alternative Energy End-uses



LARGE BIG BOX RETAIL WITH 2% WWR (CHADRON, NE)

Big Box Retail 2% WWR Energy Results Summary
Chadron, NE

Description: Drybulb Economizer; Dedicated ERV w/enthalpy wheel; CEE Tier 1 cooling equipment efficiencies; R-19+7.5 ci wall; R-30 roof; Solarban 70XL w/ thermally broken frame; Insulated dock doors

Building Energy Performance Summary

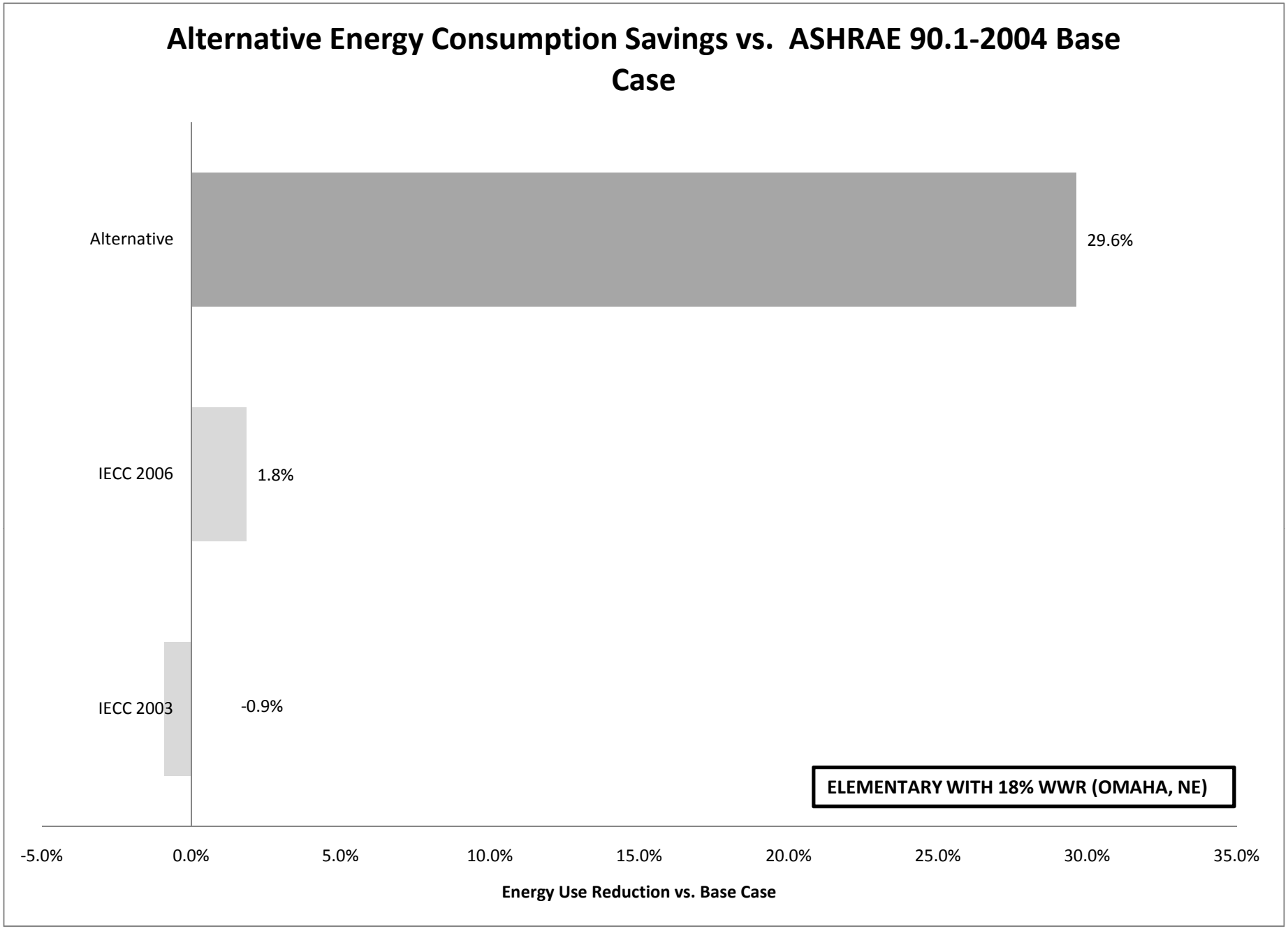
End Use	*Energy Source*	*Alternative Building*		*Average Baseline*		*Energy Difference Alt-Baseline*	*% of End Use of As Designed*	*Baseline Consumption Average*
		Energy [MMBtu]	*Peak [kW or therm/hr]*	*Energy [MMBtu]*	*Peak [kW or therm/hr]*	*[%]*	*[%]*	*[%]*
Conditioned Lighting	Electricity	2086.3	153.0	2086.3	153.0	0.0%	30.2%	24.0%
Unconditioned Lighting	Electricity	217.7	18.0	217.7	18.0	0.0%	3.2%	2.5%
Misc Equipment	Electricity	2380.9	174.6	2380.9	174.6	0.0%	34.5%	27.4%
Space Heating	Electricity			0.0	0.0		0.0%	0.0%
Space Heating	Gas	284.3	17.8	2838.4	57.2	90.0%	4.1%	32.6%
Space Heating	Steam/ HW			0.0	0.0		0.0%	0.0%
Space Cooling	Elec	891.6	178.5	816.9	261.2	-9.1%	12.9%	9.4%
Space Cooling	Chilled Water			0.0	0.0		0.0%	0.0%
Heat Rejection	Electricity			0.0	0.0		0.0%	0.0%
Pumps & Aux	Electricity	28.6	2.8	16.8	2.1	-70.5%	0.4%	0.2%
Fans - Ventilation	Electricity	979.0	67.0	310.4	75.6	-215.4%	14.2%	3.6%
Fans - Exhaust	Electricity			0.0	0.0		0.0%	0.0%
Refrigeration	Electricity			0.0	0.0		0.0%	0.0%
HP Supplement	Electricity			0.0	0.0		0.0%	0.0%
DHW	Elec			0.0	0.0		0.0%	0.0%
DHW	Gas	39.4	0.1	37.2	0.1	-5.9%	0.6%	0.4%
Total w/o Misc Equipment		**4526.9**		**6323.7**		**28.4%**	100.0%	100.0%
Alt Energy Savings		**1796.8**						
Total w/ Misc Equipment		6907.8		8704.6		20.6%		

Energy Cost Summary

Energy Source	*As Designed Cost*	*Baseline Cost*
Electricity*	$81,277	$67,521
Gas	$2,804	$24,903
Steam/ HW		$0
Chilled Water		$0
Total	**$84,081**	**$92,424**

*Electricity cost excludes Misc Equipment electrical consumption cost (based upon virtual rate)

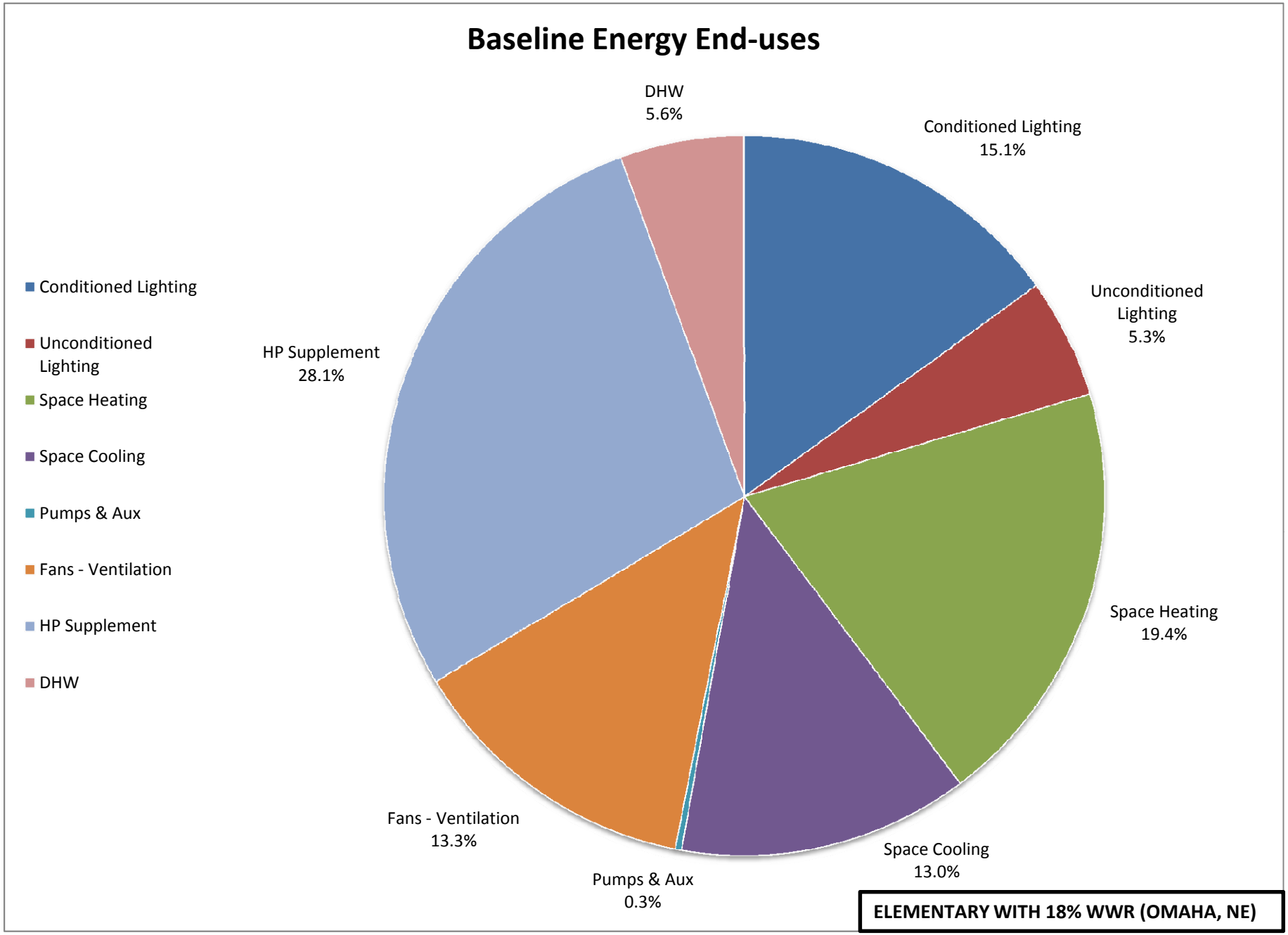
DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms


Alternative Energy Consumption Savings vs. ASHRAE 90.1-2004 Base Case
Alternative
29.6%
IECC 2006
1.8%
IECC 2003
-0.9%
ELEMENTARY WITH 18% WWR (OMAHA, NE)
-5.0%
0.0%
5.0%
10.0%
15.0%
20.0%
25.0%
30.0%
35.0%
Energy Use Reduction vs. Base Case

Elementary 18% WWR Energy Results Summary
Omaha, NE

Run	Name	Annual Energy Use* [MMBtu]	Annual Energy Cost [$]	Cost Savings vs. Avg. Base [$]	Cost Savings vs Avg. Base [%]	Energy Use Reduction vs. Base* [MMBtu]	Energy Use Reduction vs. Base* [%]	Notes
0.00	Base Case	2732.1	$56,129					
	Base +90°	2777.6	$56,766					ASHRAE 90.1-2004 Baseline Appendix G
	Base +180°	2733.5	$55,977					Walls: U-0.084; Roof: U-0.063; Floors - U-0.052
	Base +270°	2773.1	$56,606					Windows: U-0.57, SHGC-0.39
	Avg Base Case	2754.1	$56,369					
1.10	IECC 2003	2778.8	$57,091	-$722	-1.3%	-24.7	-0.9%	1.10: IECC 2003 (Omaha 13b)
1.11	IECC 2006	2703.3	$55,507	$863	1.5%	50.8	1.8%	1.11: IECC 2006
2.00	Alternative	1938.3	$39,608	$16,761	29.7%	815.8	29.6%	Dedicated ERV w/enthalpy wheel; Roof U-value = 0.056

*Reported value excludes Misc Equipment electrical end-use


Baseline Energy End-uses
DHW
5.6%
Conditioned Lighting
15.1%
Unconditioned
Lighting
5.3%
HP Supplement
28.1%
Space Heating
19.4%
Space Cooling
13.0%
Pumps & Aux
0.3%
Fans - Ventilation
13.3%
Conditioned Lighting
Unconditioned
Lighting
Space Heating
Space Cooling
Pumps & Aux
Fans - Ventilation
HP Supplement
DHW
ELEMENTARY WITH 18% WWR (OMAHA, NE)

Elementary 18% WWR Energy Results Summary
Omaha, NE

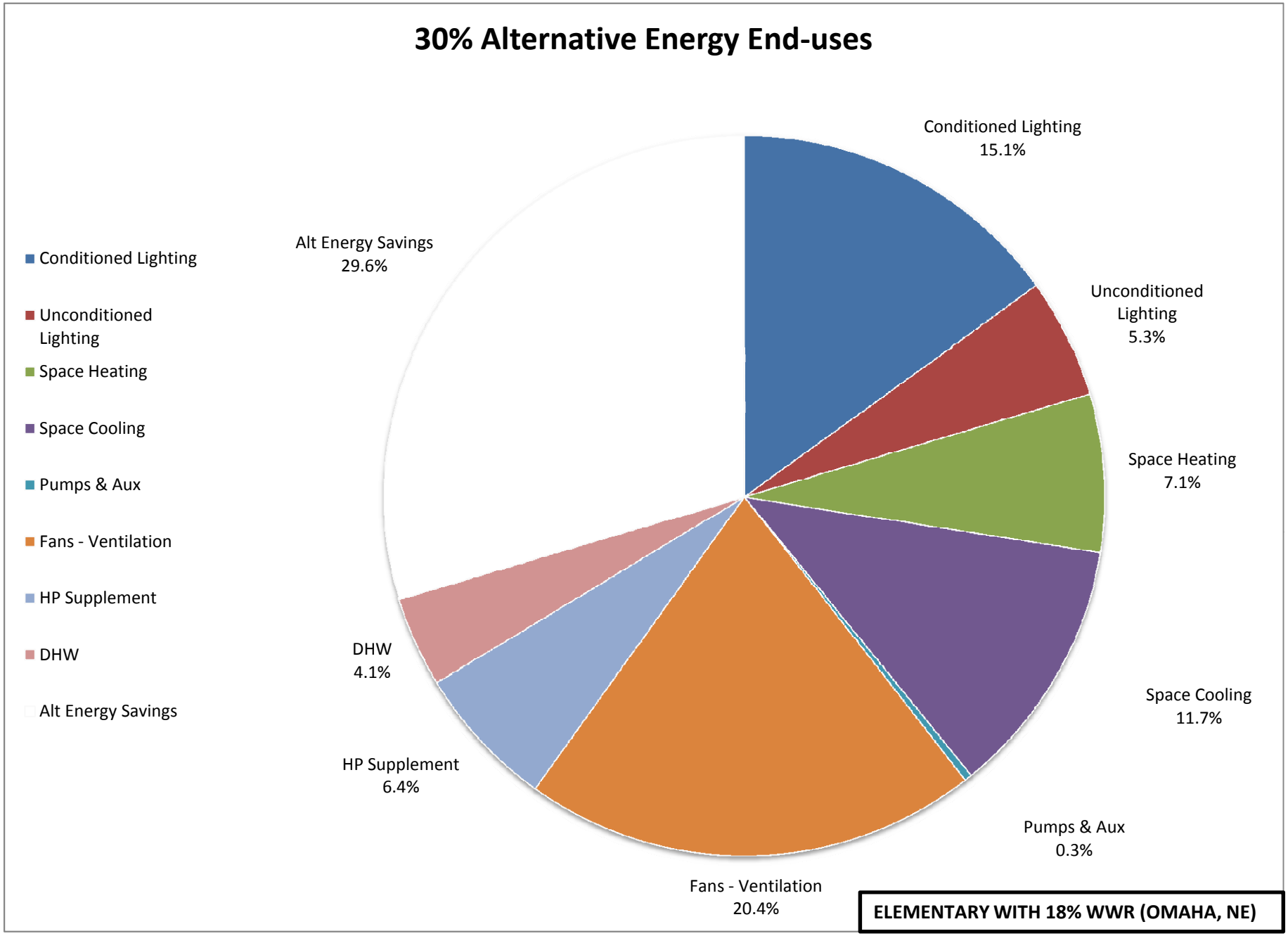
Building Energy Performance Summary - Base Case

End Use	*Energy Source*	*Baseline Building*		*Baseline Building +90*		*Baseline Building +180*		*Baseline Building +270*		Baseline Average		*% End Use of Baseline*
		Energy [MMbtu]	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	
Conditioned Lighting	Electricity	414.6	57.0	414.6	57.0	414.6	57.0	414.6	57.0	414.6	57.0	11.1%
Unconditioned Lighting	Electricity	147.2	10.0	147.2	10.0	147.2	10.0	147.2	10.0	147.2	10.0	4.0%
Misc Equipment	Electricity	971.2	114.8	971.2	114.8	971.2	114.8	971.2	114.8	971.2	114.8	26.1%
Space Heating	Electricity	538.4	211.4	527.7	201.6	540.5	211.3	525.6	201.8	533.1	206.5	14.3%
Space Heating	Gas									0.0	0.0	0.0%
Space Heating	Steam/ HW									0.0	0.0	0.0%
Space Cooling	Electricity	354.0	621.7	363.5	248.8	353.5	261.5	363.9	248.9	358.7	345.2	9.6%
Space Cooling	CHW									0.0	0.0	0.0%
Heat Rejection	Electricity									0.0	0.0	0.0%
Pumps & Aux	Electricity	7.9	0.9	7.9	0.9	7.9	0.9	7.9	0.9	7.9	0.9	0.2%
Fans - Ventilation	Electricity	360.2	33.6	372.3	33.9	360.2	33.7	371.7	33.9	366.1	33.8	9.8%
Fans - Exhaust	Electricity									0.0	0.0	0.0%
Refrigeration	Electricity									0.0	0.0	0.0%
HP Supplement	Electricity	756.3	783.7	790.9	783.6	756.1	783.6	788.7	783.7	773.0	783.7	20.8%
DHW	Elec									0.0	0.0	0.0%
DHW	Gas	153.5	1.0	153.5	1.0	153.5	1.0	153.5	1.0	153.5	1.0	4.1%
Total w/o Misc Equipment		2732.1		2777.6		2733.5		2773.1		2754.1		
Total w/ Misc Equipment		3703.3		3748.8		3704.7		3744.3		3725.3		

Energy Cost Summary

Energy Source	*Baseline Cost*	*Baseline Cost +90*	*Baseline Cost +180*	*Baseline Cost +270*	**Baseline Average**
Electricity*	$54,518	$55,155	$54,366	$54,995	**$54,758**
Gas	$1,611	$1,611	$1,611	$1,611	**$1,611**
Steam/ HW					**$0**
Chilled Water					**$0**
Total	**$56,129**	**$56,766**	**$55,977**	**$56,606**	**$56,369**

*Electricity cost excludes Misc Equipment consumption cost (based upon virtual rate)
DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-F; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms


30% Alternative Energy End-uses
Conditioned Lighting
Unconditioned Lighting
Space Heating
Space Cooling
Pumps & Aux
Fans - Ventilation
HP Supplement
DHW
Alt Energy Savings
Conditioned Lighting 15.1%
Unconditioned Lighting 5.3%
Space Heating 7.1%
Space Cooling 11.7%
Pumps & Aux 0.3%
Fans - Ventilation 20.4%
HP Supplement 6.4%
DHW 4.1%
Alt Energy Savings 29.6%
ELEMENTARY WITH 18% WWR (OMAHA, NE)

Elementary 18% WWR Energy Results Summary
Omaha, NE

Description: Dedicated ERV w/enthalpy wheel; Roof U-value = 0.056

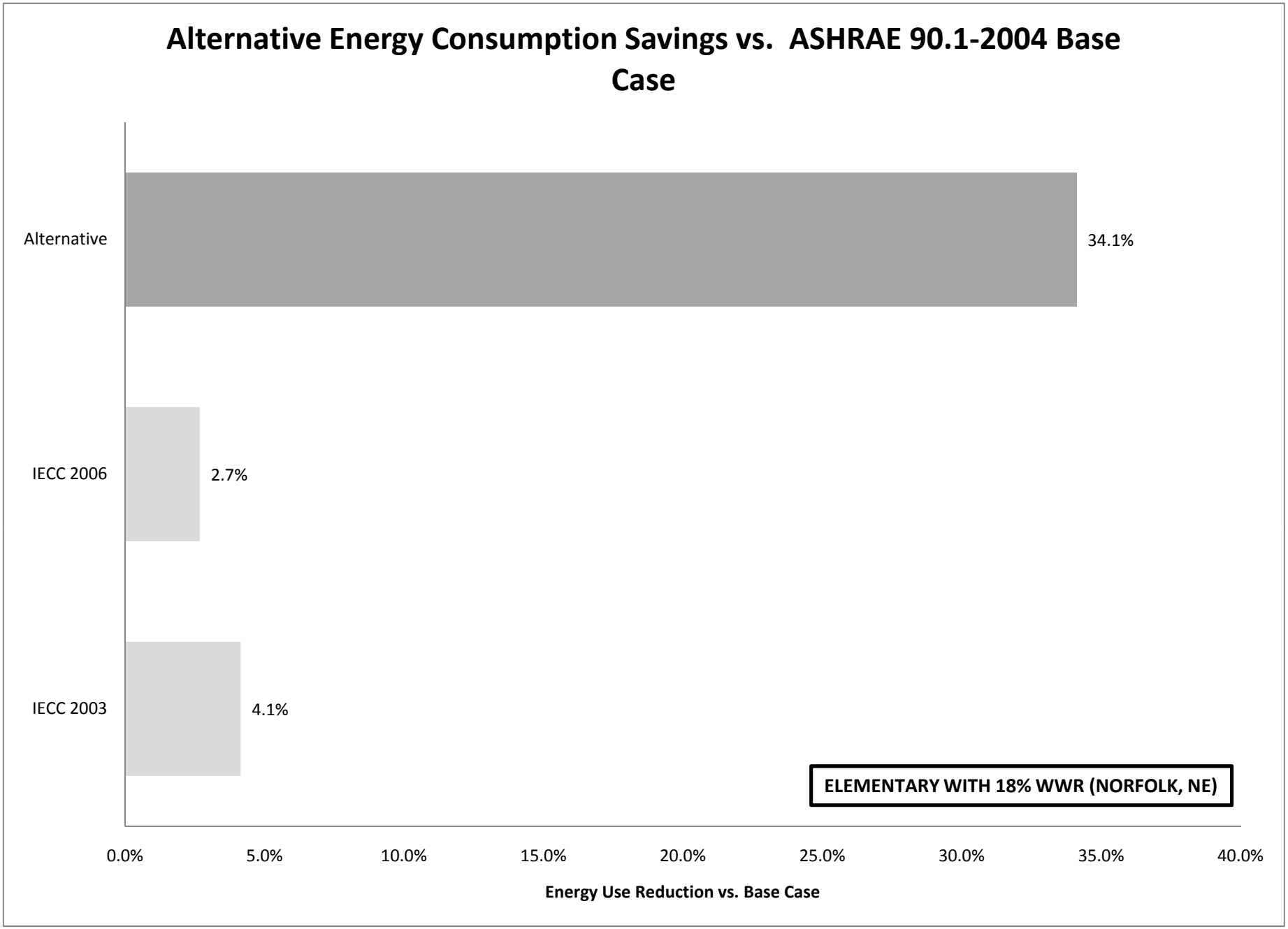
Building Energy Performance Summary

End Use	*Energy Source*	*Alternative Building*		*Average Baseline*		*Energy Difference Alt-Baseline*	*% of End Use of As Designed*	*Baseline Consumption Average*
		Energy [MMBtu]	*Peak [kW or therm/hr]*	*Energy [MMBtu]*	*Peak [kW or therm/hr]*	*[%]*	*[%]*	*[%]*
Conditioned Lighting	Electricity	414.6	57.0	414.6	57.0	0.0%	14.2%	11.1%
Unconditioned Lighting	Electricity	147.2	10.0	147.2	10.0	0.0%	5.1%	4.0%
Misc Equipment	Electricity	971.2	114.8	971.2	114.8	0.0%	33.4%	26.1%
Space Heating	Electricity	195.3	181.7	533.1	206.5	63.4%	6.7%	14.3%
Space Heating	Gas			0.0	0.0		0.0%	0.0%
Space Heating	Steam/ HW			0.0	0.0		0.0%	0.0%
Space Cooling	Elec	321.3	198.1	358.7	345.2	10.4%	11.0%	9.6%
Space Cooling	Chilled Water			0.0	0.0		0.0%	0.0%
Heat Rejection	Electricity			0.0	0.0		0.0%	0.0%
Pumps & Aux	Electricity	9.3	0.9	7.9	0.9	-17.7%	0.3%	0.2%
Fans - Ventilation	Electricity	561.2	67.0	366.1	33.8	-53.3%	19.3%	9.8%
Fans - Exhaust	Electricity			0.0	0.0		0.0%	0.0%
Refrigeration	Electricity			0.0	0.0		0.0%	0.0%
HP Supplement	Electricity	177.4	343.8	773.0	783.7	77.1%	6.1%	20.8%
DHW	Elec	112.0	21.1	0.0	0.0		3.8%	0.0%
DHW	Gas			153.5	1.0	100.0%	0.0%	4.1%
Total w/o Misc Equipment		**1938.3**		**2754.1**		**29.6%**	100.0%	100.0%
Alt Energy Savings		**815.8**						
Total w/ Misc Equipment		2909.5		3725.3		21.9%		

Energy Cost Summary

Energy Source	*As Designed Cost*	*Baseline Cost*
Electricity*	$39,608	$54,758
Gas		$1,611
Steam/ HW		$0
Chilled Water		$0
Total	**$39,608**	**$56,369**

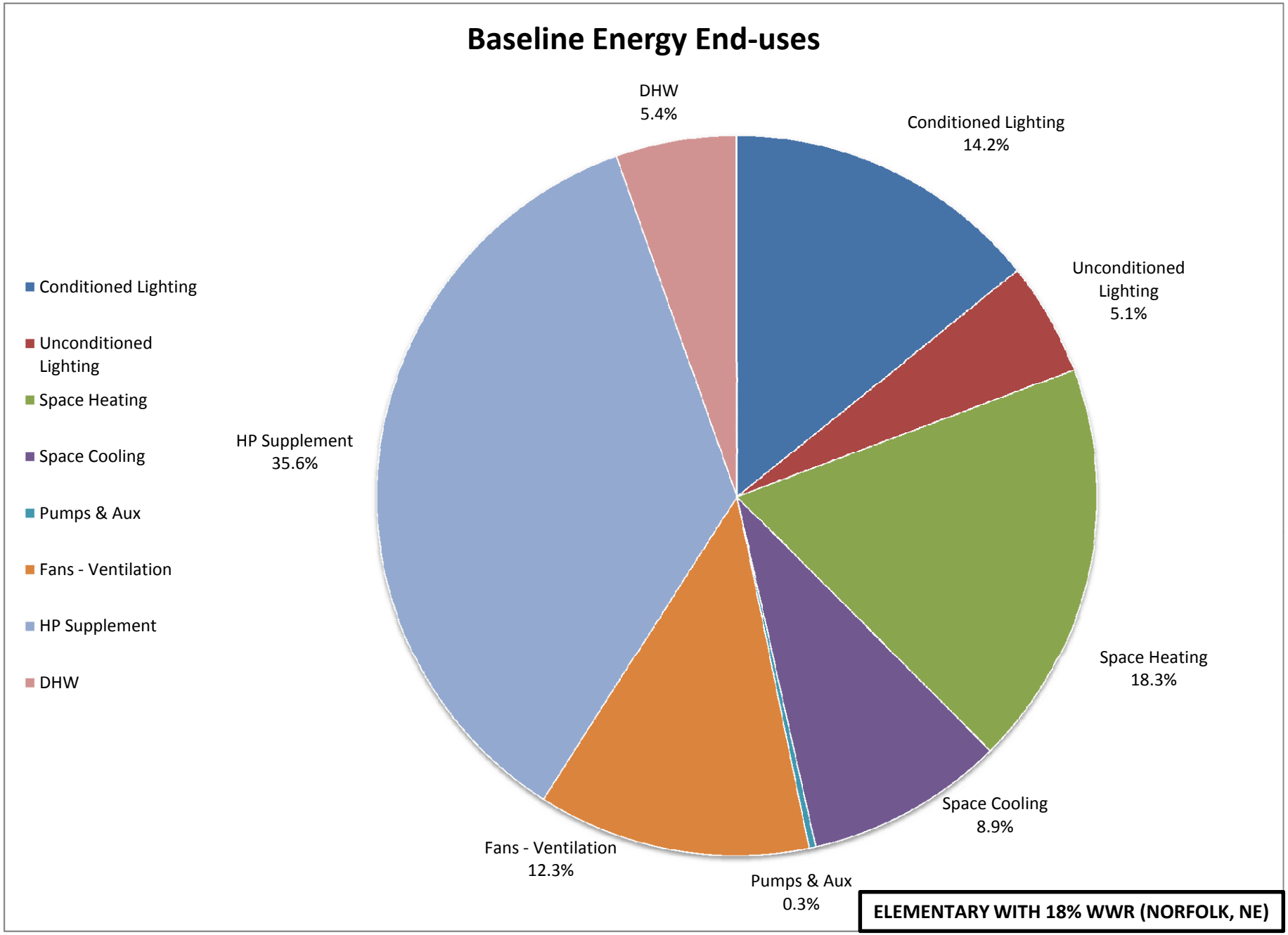
*Electricity cost excludes Misc Equipment consumption cost (based upon virtual rate)
DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms


Alternative Energy Consumption Savings vs. ASHRAE 90.1-2004 Base Case
Alternative
34.1%
IECC 2006
2.7%
IECC 2003
4.1%
ELEMENTARY WITH 18% WWR (NORFOLK, NE)
0.0%
5.0%
10.0%
15.0%
20.0%
25.0%
30.0%
35.0%
40.0%
Energy Use Reduction vs. Base Case

Elementary 18% WWR Energy Results Summary
Norfolk, NE

Run	Name	Annual Energy Use* [MMBtu]	Annual Energy Cost [$]	Cost Savings vs. Avg. Base [$]	Cost Savings vs Avg. Base [%]	Energy Use Reduction vs. Base* [MMBtu]	Energy Use Reduction vs. Base* [%]	Notes
0.00	Base Case	2888.1	$49,410					
	Base +90°	2939.4	$50,360					ASHRAE 90.1-2004 Baseline
	Base +180°	2887.6	$49,401					Appendix G
	Base +270°	2936.5	$50,321					Walls: U-0.084; Roof: U-0.063; Floors - U-0.052
	Avg Base Case	2912.9	$49,873					Windows: U-0.57, SHGC-0.39
1.10	IECC 2003	2792.1	$48,090	$1,783	3.6%	120.8	4.1%	1.10: IECC 2003 (Norfolk 14b)
1.11	IECC 2006	2834.9	$48,607	$1,265	2.5%	78.0	2.7%	1.11: IECC 2006

*Reported value excludes Misc Equipment electrical end-use


Baseline Energy End-uses
DHW
5.4%
Conditioned Lighting
14.2%
Unconditioned
Lighting
5.1%
Space Heating
18.3%
Space Cooling
8.9%
Pumps & Aux
0.3%
Fans - Ventilation
12.3%
HP Supplement
35.6%
Conditioned Lighting
Unconditioned
Lighting
Space Heating
Space Cooling
Pumps & Aux
Fans - Ventilation
HP Supplement
DHW
ELEMENTARY WITH 18% WWR (NORFOLK, NE)

Elementary 18% WWR Energy Results Summary
Norfolk, NE

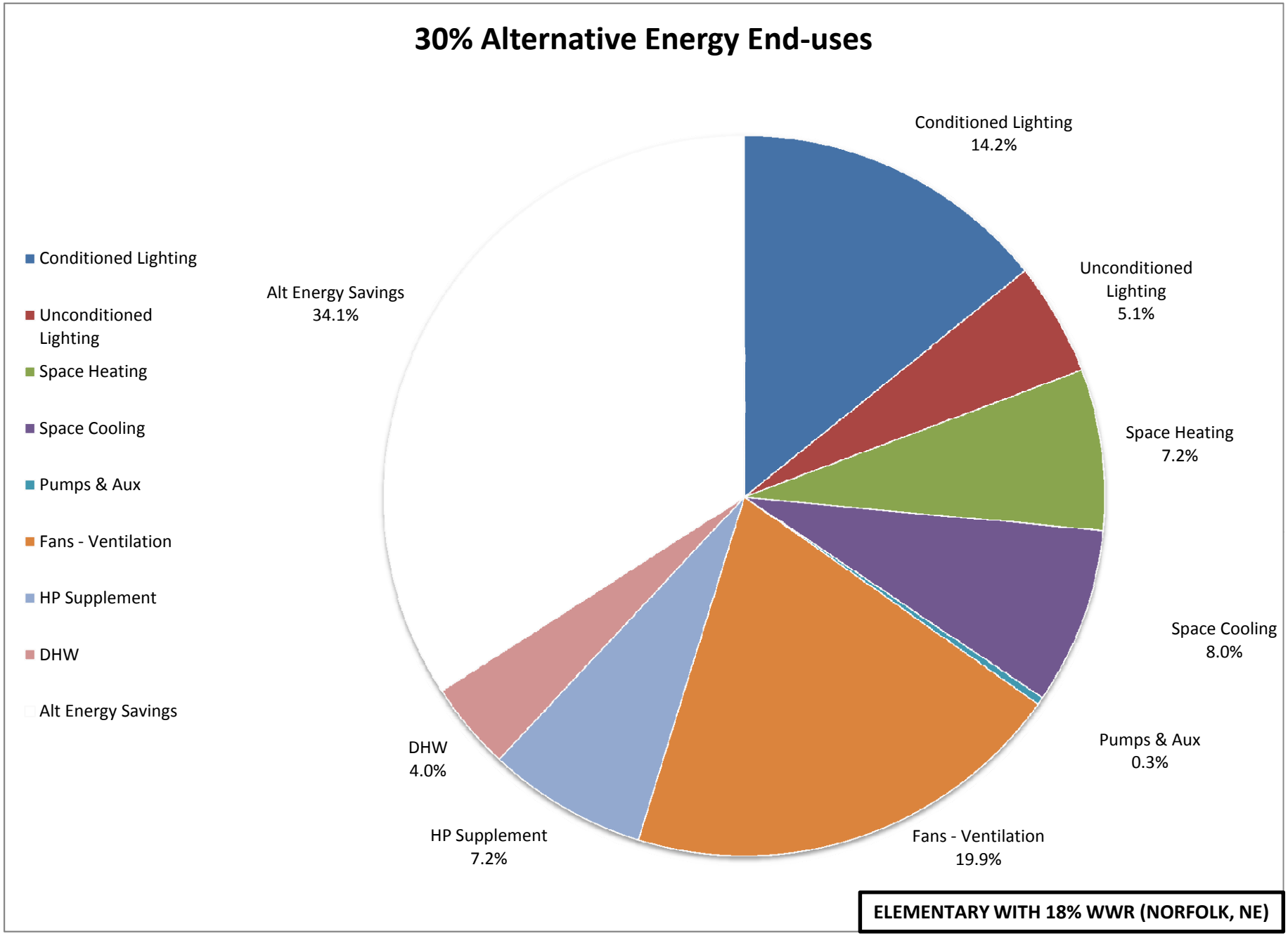
Building Energy Performance Summary - Base Case

End Use	*Energy Source*	*Baseline Building*		*Baseline Building +90*		*Baseline Building +180*		*Baseline Building +270*		Baseline Average		*% End Use of Baseline*
		Energy [MMbtu]	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	
Conditioned Lighting	Electricity	414.6	57.0	414.6	57.0	414.6	57.0	414.6	57.0	414.6	57.0	10.7%
Unconditioned Lighting	Electricity	147.2	10.0	147.2	10.0	147.2	10.0	147.2	10.0	147.2	10.0	3.8%
Misc Equipment	Electricity	971.2	114.8	971.2	114.8	971.2	114.8	971.2	114.8	971.2	114.8	25.0%
Space Heating	Electricity	540.8	183.5	523.3	170.9	542.0	183.3	521.7	178.3	532.0	179.0	13.7%
Space Heating	Gas									0.0	0.0	0.0%
Space Heating	Steam/ HW									0.0	0.0	0.0%
Space Cooling	Electricity	256.2	216.9	263.2	202.8	255.9	216.8	263.7	204.9	259.8	210.4	6.7%
Space Cooling	CHW									0.0	0.0	0.0%
Heat Rejection	Electricity									0.0	0.0	0.0%
Pumps & Aux	Electricity	8.7	0.9	8.7	0.9	8.7	0.9	8.6	0.9	8.7	0.9	0.2%
Fans - Ventilation	Electricity	351.8	33.2	362.5	33.2	351.5	33.2	362.0	33.1	357.0	33.2	9.2%
Fans - Exhaust	Electricity									0.0	0.0	0.0%
Refrigeration	Electricity									0.0	0.0	0.0%
HP Supplement	Electricity	1010.8	837.8	1061.9	838.3	1009.7	839.0	1060.7	852.4	1035.8	841.9	26.7%
DHW	Elec									0.0	0.0	0.0%
DHW	Gas	158.0	1.0	158.0	1.0	158.0	1.0	158.0	1.0	158.0	1.0	4.1%
Total w/o Misc Equipment		2888.1		2939.4		2887.6		2936.5		2912.9		
Total w/ Misc Equipment		3859.3		3910.6		3858.8		3907.7		3884.1		

Energy Cost Summary

Energy Source	*Baseline Cost*	*Baseline Cost +90*	*Baseline Cost +180*	*Baseline Cost +270*	**Baseline Average**
Electricity*	$47,900	$48,850	$47,891	$48,811	**$48,363**
Gas	$1,510	$1,510	$1,510	$1,510	**$1,510**
Steam/ HW					**$0**
Chilled Water					**$0**
Total	**$49,410**	**$50,360**	**$49,401**	**$50,321**	**$49,873**

*Electricity cost excludes Misc Equipment consumption cost (based upon virtual rate)
DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-F; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms


30% Alternative Energy End-uses
Conditioned Lighting
Unconditioned Lighting
Space Heating
Space Cooling
Pumps & Aux
Fans - Ventilation
HP Supplement
DHW
Alt Energy Savings
Conditioned Lighting 14.2%
Unconditioned Lighting 5.1%
Space Heating 7.2%
Space Cooling 8.0%
Pumps & Aux 0.3%
Fans - Ventilation 19.9%
HP Supplement 7.2%
DHW 4.0%
Alt Energy Savings 34.1%
ELEMENTARY WITH 18% WWR (NORFOLK, NE)

Elementary 18% WWR Energy Results Summary
Norfolk, NE

Description: Dedicated ERV w/enthalpy wheel; Roof U-value = 0.056

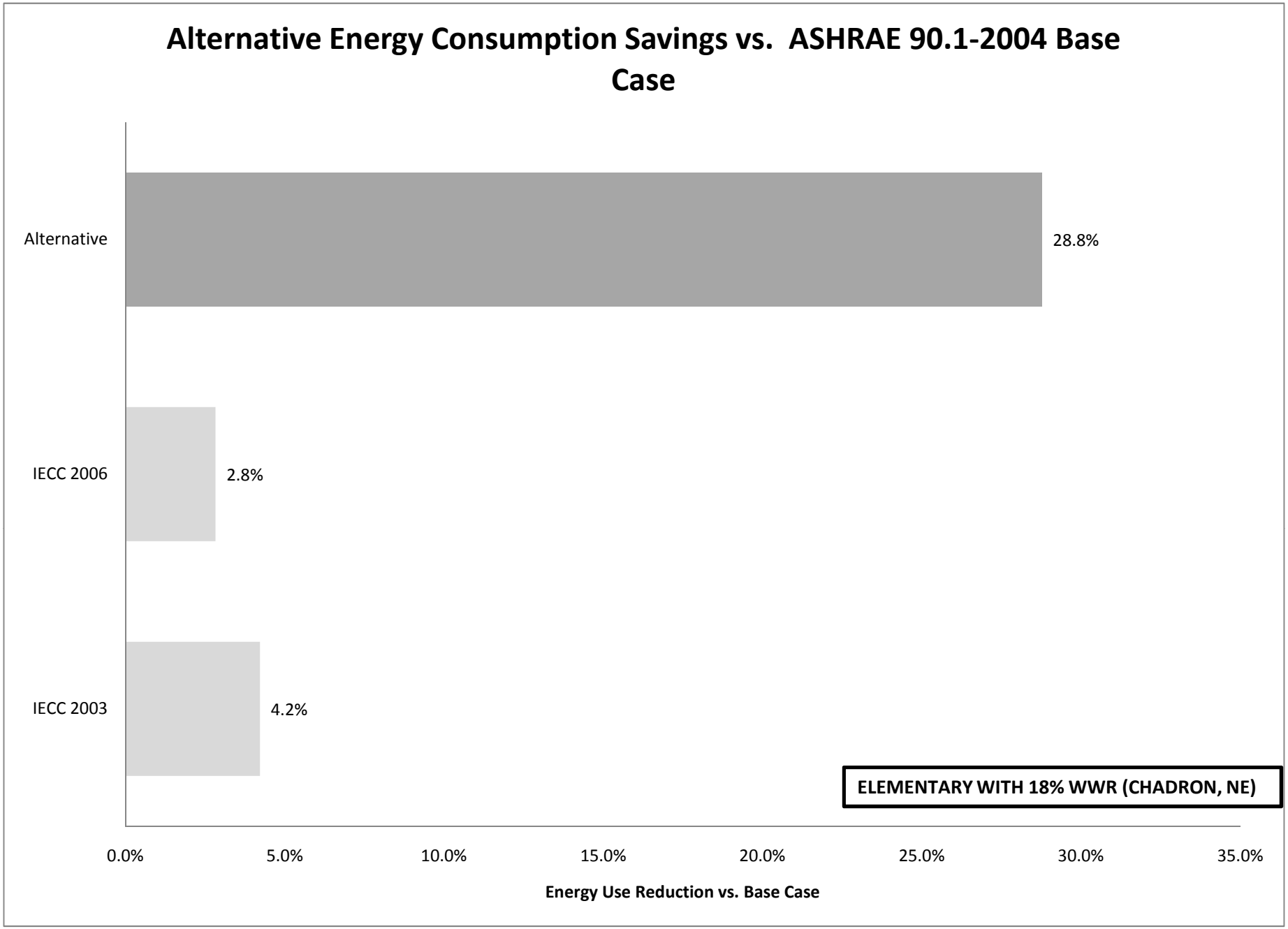
Building Energy Performance Summary

End Use	*Energy Source*	*Alternative Building*		*Average Baseline*		*Energy Difference Alt-Baseline*	*% of End Use of As Designed*	*Baseline Consumption Average*
		Energy [MMBtu]	*Peak [kW or therm/hr]*	*Energy [MMBtu]*	*Peak [kW or therm/hr]*	*[%]*	*[%]*	*[%]*
Conditioned Lighting	Electricity	414.6	57.0	414.6	57.0	0.0%	14.3%	10.7%
Unconditioned Lighting	Electricity	147.2	10.0	147.2	10.0	0.0%	5.1%	3.8%
Misc Equipment	Electricity	971.2	114.8	971.2	114.8	0.0%	33.6%	25.0%
Space Heating	Electricity	210.0	144.1	532.0	179.0	60.5%	7.3%	13.7%
Space Heating	Gas			0.0	0.0		0.0%	0.0%
Space Heating	Steam/ HW			0.0	0.0		0.0%	0.0%
Space Cooling	Elec	232.6	187.9	259.8	210.4	10.5%	8.0%	6.7%
Space Cooling	Chilled Water			0.0	0.0		0.0%	0.0%
Heat Rejection	Electricity			0.0	0.0		0.0%	0.0%
Pumps & Aux	Electricity	10.1	0.9	8.7	0.9	-16.4%	0.3%	0.2%
Fans - Ventilation	Electricity	580.6	66.7	357.0	33.2	-62.7%	20.1%	9.2%
Fans - Exhaust	Electricity			0.0	0.0		0.0%	0.0%
Refrigeration	Electricity			0.0	0.0		0.0%	0.0%
HP Supplement	Electricity	208.7	355.7	1035.8	841.9	79.9%	7.2%	26.7%
DHW	Elec	115.3	21.9	0.0	0.0		4.0%	0.0%
DHW	Gas			158.0	1.0	100.0%	0.0%	4.1%
Total w/o Misc Equipment		**1919.1**		**2912.9**		**34.1%**	100.0%	100.0%
Alt Energy Savings		**993.8**						
Total w/ Misc Equipment		2890.3		3884.1		25.6%		

Energy Cost Summary

Energy Source	*As Designed Cost*	*Baseline Cost*
Electricity*	$34,741	$48,363
Gas		$1,510
Steam/ HW		$0
Chilled Water		$0
Total	**$34,741**	**$49,873**

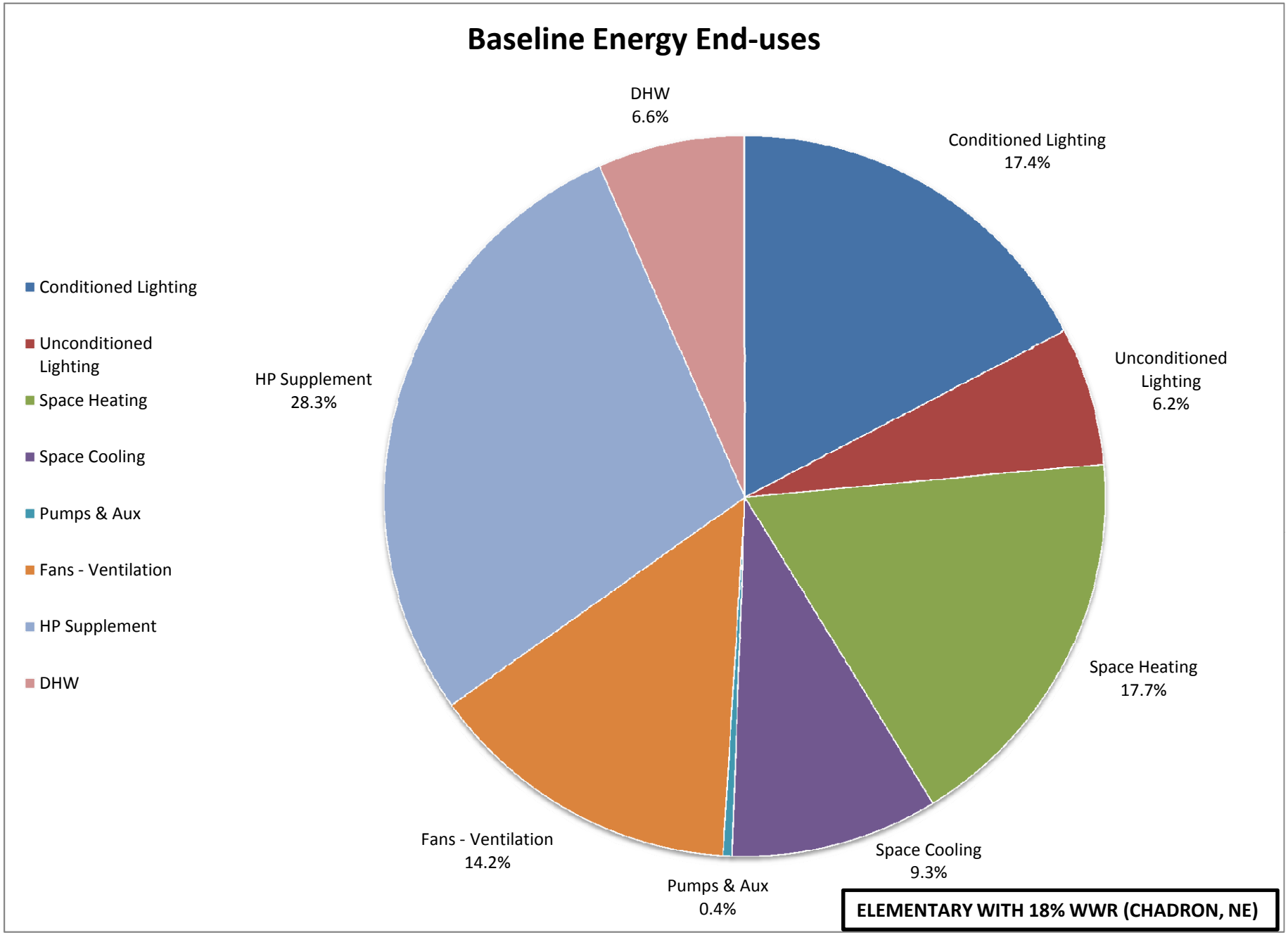
*Electricity cost excludes Misc Equipment consumption cost (based upon virtual rate)
DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms


Alternative Energy Consumption Savings vs. ASHRAE 90.1-2004 Base Case
Alternative
28.8%
IECC 2006
2.8%
IECC 2003
4.2%
ELEMENTARY WITH 18% WWR (CHADRON, NE)
0.0%
5.0%
10.0%
15.0%
20.0%
25.0%
30.0%
35.0%
Energy Use Reduction vs. Base Case

Elementary 18% WWR Energy Results Summary
Chadron, NE

Run	Name	Annual Energy Use* [MMBtu]	Annual Energy Cost [$]	Cost Savings vs. Avg. Base [$]	Cost Savings vs Avg. Base [%]	Energy Use Reduction vs. Base* [MMBtu]	Energy Use Reduction vs. Base* [%]	Notes
0.00	Base Case	2363.6	$40,228					
	Base +90°	2408.6	$41,080					ASHRAE 90.1-2004 Baseline
	Base +180°	2368.2	$40,298					Appendix G
	Base +270°	2404.2	$41,017					Walls: U-0.084; Roof: U-0.063; Floors - U-0.052
	Avg Base Case	2386.2	$40,656					Windows: U-0.57, SHGC-0.39
1.10	IECC 2003	2285.4	$39,124	$1,532	3.8%	100.8	4.2%	1.10: IECC 2003 (Chadron 15)
1.11	IECC 2006	2318.6	$39,767	$889	2.2%	67.6	2.8%	1.11: IECC 2006

*Reported value excludes Misc Equipment electrical end-use


Baseline Energy End-uses
DHW
6.6%
Conditioned Lighting
17.4%
Unconditioned
Lighting
6.2%
Space Heating
17.7%
Space Cooling
9.3%
Pumps & Aux
0.4%
Fans - Ventilation
14.2%
HP Supplement
28.3%
Conditioned Lighting
Unconditioned
Lighting
Space Heating
Space Cooling
Pumps & Aux
Fans - Ventilation
HP Supplement
DHW
ELEMENTARY WITH 18% WWR (CHADRON, NE)

Elementary 18% WWR Energy Results Summary
Chadron, NE

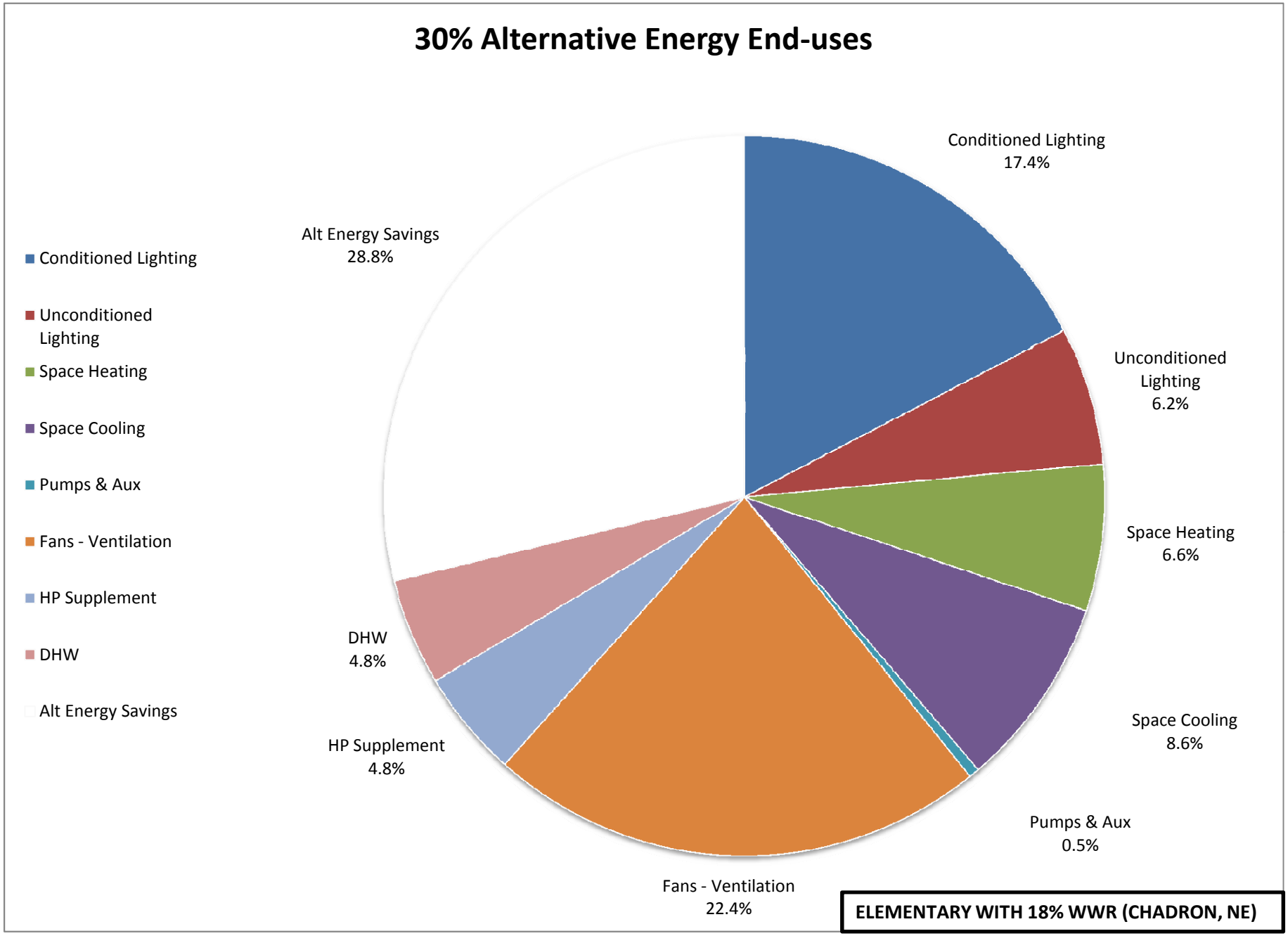
Building Energy Performance Summary - Base Case

End Use	*Energy Source*	*Baseline Building*		*Baseline Building +90*		*Baseline Building +180*		*Baseline Building +270*		Baseline Average		*% End Use of Baseline*
		Energy [MMbtu]	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	
Conditioned Lighting	Electricity	414.6	57.0	414.6	57.0	414.6	57.0	414.6	57.0	414.6	57.0	12.3%
Unconditioned Lighting	Electricity	147.2	10.0	147.2	10.0	147.2	10.0	147.2	10.0	147.2	10.0	4.4%
Misc Equipment	Electricity	971.2	114.8	971.2	114.8	971.2	114.8	971.2	114.8	971.2	114.8	28.9%
Space Heating	Electricity	415.9	165.9	429.8	166.5	419.1	165.7	426.5	166.6	422.8	166.2	12.6%
Space Heating	Gas									0.0	0.0	0.0%
Space Heating	Steam/ HW									0.0	0.0	0.0%
Space Cooling	Electricity	216.4	176.0	227.5	176.3	216.0	175.9	228.2	176.3	222.0	176.1	6.6%
Space Cooling	CHW									0.0	0.0	0.0%
Heat Rejection	Electricity									0.0	0.0	0.0%
Pumps & Aux	Electricity	9.6	0.9	9.6	0.9	9.7	0.9	9.5	0.9	9.6	0.9	0.3%
Fans - Ventilation	Electricity	331.9	33.6	344.3	33.8	332.1	33.7	343.8	33.8	338.0	33.7	10.1%
Fans - Exhaust	Electricity									0.0	0.0	0.0%
Refrigeration	Electricity									0.0	0.0	0.0%
HP Supplement	Electricity	670.6	759.3	678.2	759.2	672.1	759.2	677.0	759.2	674.5	759.2	20.1%
DHW	Elec									0.0	0.0	0.0%
DHW	Gas	157.4	1.0	157.4	1.0	157.4	1.0	157.4	1.0	157.4	1.0	4.7%
Total w/o Misc Equipment		2363.6		2408.6		2368.2		2404.2		2386.2		
Total w/ Misc Equipment		3334.8		3379.8		3339.4		3375.4		3357.4		

Energy Cost Summary

Energy Source	*Baseline Cost*	*Baseline Cost +90*	*Baseline Cost +180*	*Baseline Cost +270*	**Baseline Average**
Electricity*	$38,863	$39,715	$38,933	$39,652	**$39,291**
Gas	$1,365	$1,365	$1,365	$1,365	**$1,365**
Steam/ HW					**$0**
Chilled Water					**$0**
Total	**$40,228**	**$41,080**	**$40,298**	**$41,017**	**$40,656**

*Electricity cost excludes Misc Equipment consumption cost (based upon virtual rate)
DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-F; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms


30% Alternative Energy End-uses
Conditioned Lighting
Unconditioned Lighting
Space Heating
Space Cooling
Pumps & Aux
Fans - Ventilation
HP Supplement
DHW
Alt Energy Savings
Conditioned Lighting 17.4%
Unconditioned Lighting 6.2%
Space Heating 6.6%
Space Cooling 8.6%
Pumps & Aux 0.5%
Fans - Ventilation 22.4%
HP Supplement 4.8%
DHW 4.8%
Alt Energy Savings 28.8%
ELEMENTARY WITH 18% WWR (CHADRON, NE)

Elementary 18% WWR Energy Results Summary
Chadron, NE

Description: Dedicated ERV w/enthalpy wheel; Roof U-value = 0.056

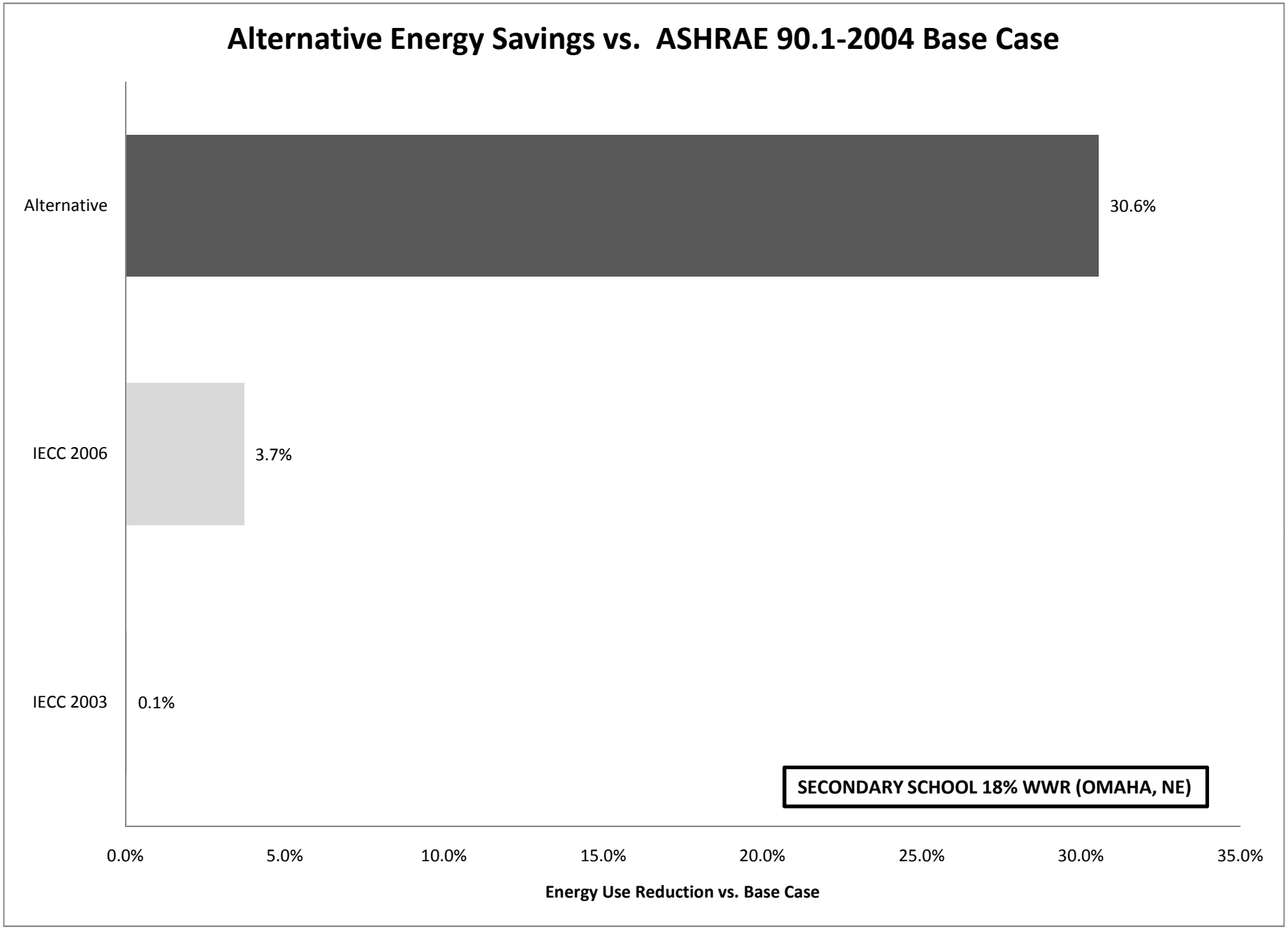
Building Energy Performance Summary

End Use	*Energy Source*	*Alternative Building*		*Average Baseline*		*Energy Difference Alt-Baseline*	*% of End Use of As Designed*	*Baseline Consumption Average*
		Energy [MMBtu]	*Peak [kW or therm/hr]*	*Energy [MMBtu]*	*Peak [kW or therm/hr]*	*[%]*	*[%]*	*[%]*
Conditioned Lighting	Electricity	414.6	57.0	414.6	57.0	0.0%	15.5%	12.3%
Unconditioned Lighting	Electricity	147.2	10.0	147.2	10.0	0.0%	5.5%	4.4%
Misc Equipment	Electricity	971.2	114.8	971.2	114.8	0.0%	36.4%	28.9%
Space Heating	Electricity	157.5	126.9	422.8	166.2	62.8%	5.9%	12.6%
Space Heating	Gas			0.0	0.0		0.0%	0.0%
Space Heating	Steam/ HW			0.0	0.0		0.0%	0.0%
Space Cooling	Elec	205.6	162.2	222.0	176.1	7.4%	7.7%	6.6%
Space Cooling	Chilled Water			0.0	0.0		0.0%	0.0%
Heat Rejection	Electricity			0.0	0.0		0.0%	0.0%
Pumps & Aux	Electricity	11.1	0.9	9.6	0.9	-15.6%	0.4%	0.3%
Fans - Ventilation	Electricity	533.7	67.2	338.0	33.7	-57.9%	20.0%	10.1%
Fans - Exhaust	Electricity			0.0	0.0		0.0%	0.0%
Refrigeration	Electricity			0.0	0.0		0.0%	0.0%
HP Supplement	Electricity	115.1	296.9	674.5	759.2	82.9%	4.3%	20.1%
DHW	Elec	114.9	21.2	0.0	0.0		4.3%	0.0%
DHW	Gas			157.4	1.0	100.0%	0.0%	4.7%
Total w/o Misc Equipment		**1699.7**		**2386.2**		**28.8%**	100.0%	100.0%
Alt Energy Savings		**686.5**						
Total w/ Misc Equipment		2670.9		3357.4		20.4%		

Energy Cost Summary

Energy Source	*As Designed Cost*	*Baseline Cost*
Electricity*	$30,754	$39,291
Gas		$1,365
Steam/ HW		$0
Chilled Water		$0
Total	**$30,754**	**$40,656**

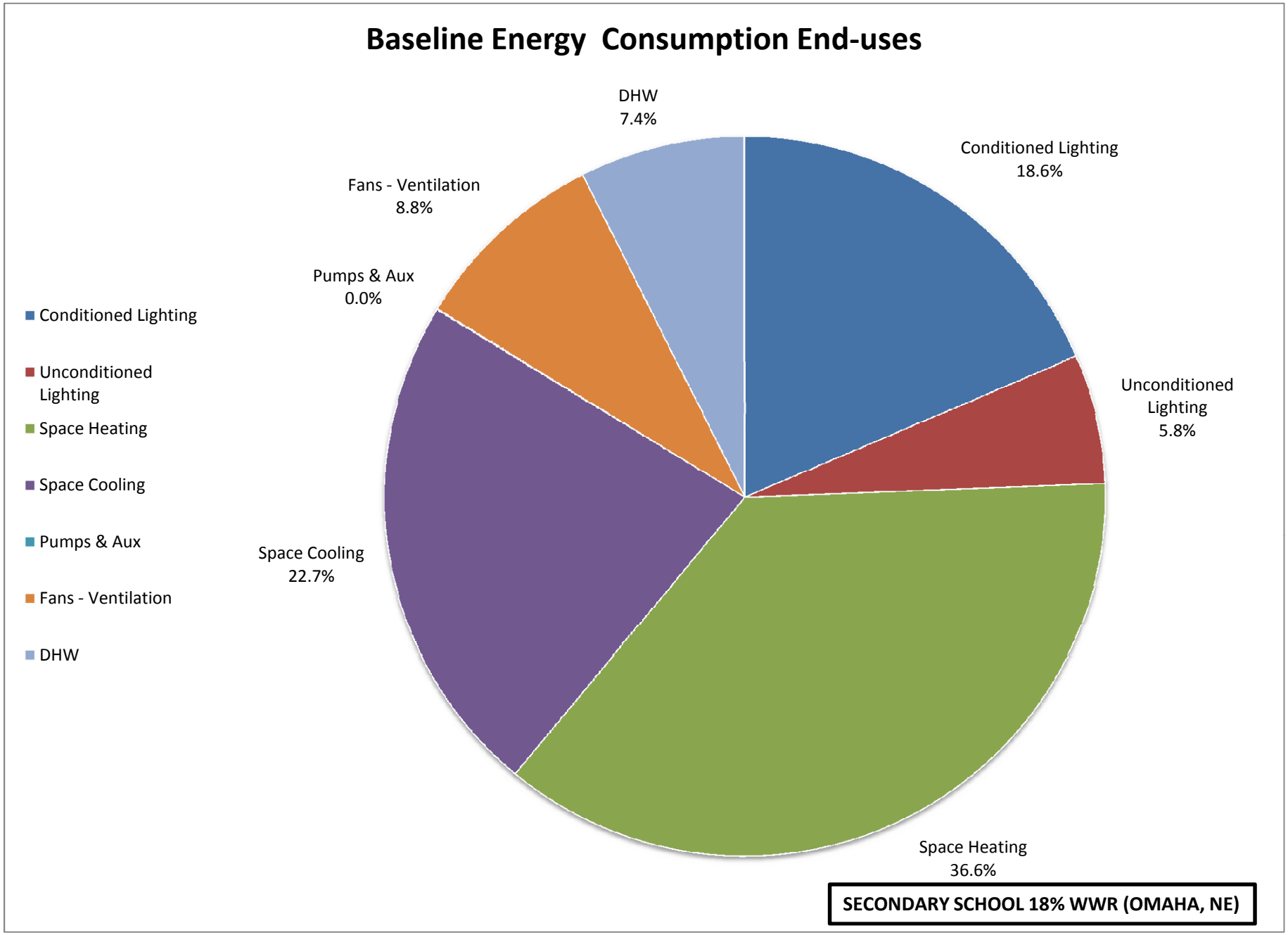
*Electricity cost excludes Misc Equipment consumption cost (based upon virtual rate)
DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms


Alternative Energy Savings vs. ASHRAE 90.1-2004 Base Case
Alternative
30.6%
IECC 2006
3.7%
IECC 2003
0.1%
SECONDARY SCHOOL 18% WWR (OMAHA, NE)
0.0%
5.0%
10.0%
15.0%
20.0%
25.0%
30.0%
35.0%
Energy Use Reduction vs. Base Case

Secondary School 18% WWR Energy Results Summary
Omaha, NE

Run	Name	Annual Energy Use* [MMBtu]	Annual Energy Cost [$]	Cost Savings vs. Avg. Base [$]	Cost Savings vs Avg. Base [%]	Energy Use Reduction vs. Base* [MMBtu]	Energy Use Reduction vs. Base* [%]	Notes
0.00	Base Case Base +90° Base +180° Base +270° Avg Base Case	4192.4 4144.5 4175.2 4150.9 4165.8	$81,880 $80,976 $81,566 $81,113 $81,384					ASHRAE 90.1-2004 Baseline Appendix G Walls: U-0.084; Roof: U-0.063; Floors - U-0.052 Windows: U-0.57, SHGC-0.39
1.10	IECC 2003	4163.6	$81,600	-$216	-0.3%	2.1	0.1%	1.10: IECC 2003 (Omaha, Zone 13B)
1.11	IECC 2006	4010.6	$78,762	$2,622	3.2%	155.2	3.7%	1.11: IECC 2006
2.00	Alternative	2892.7	$59,625	$21,759	26.7%	1273.1	30.6%	2.00 CEE Tier 1 Equipment Efficiency, ERV, R-20ci Roof, R-13 + 7.5ci Wall, Glazing U-0.402 and SHGC = 0.270

*Reported value excludes Misc Equipment electrical end-use


Baseline Energy Consumption End-uses
DHW
7.4%
Conditioned Lighting
18.6%
Fans - Ventilation
8.8%
Pumps & Aux
0.0%
Unconditioned
Lighting
5.8%
Space Cooling
22.7%
Space Heating
36.6%
Conditioned Lighting
Unconditioned Lighting
Space Heating
Space Cooling
Pumps & Aux
Fans - Ventilation
DHW
SECONDARY SCHOOL 18% WWR (OMAHA, NE)

Secondary School 18% WWR Energy Results Summary
Omaha, NE

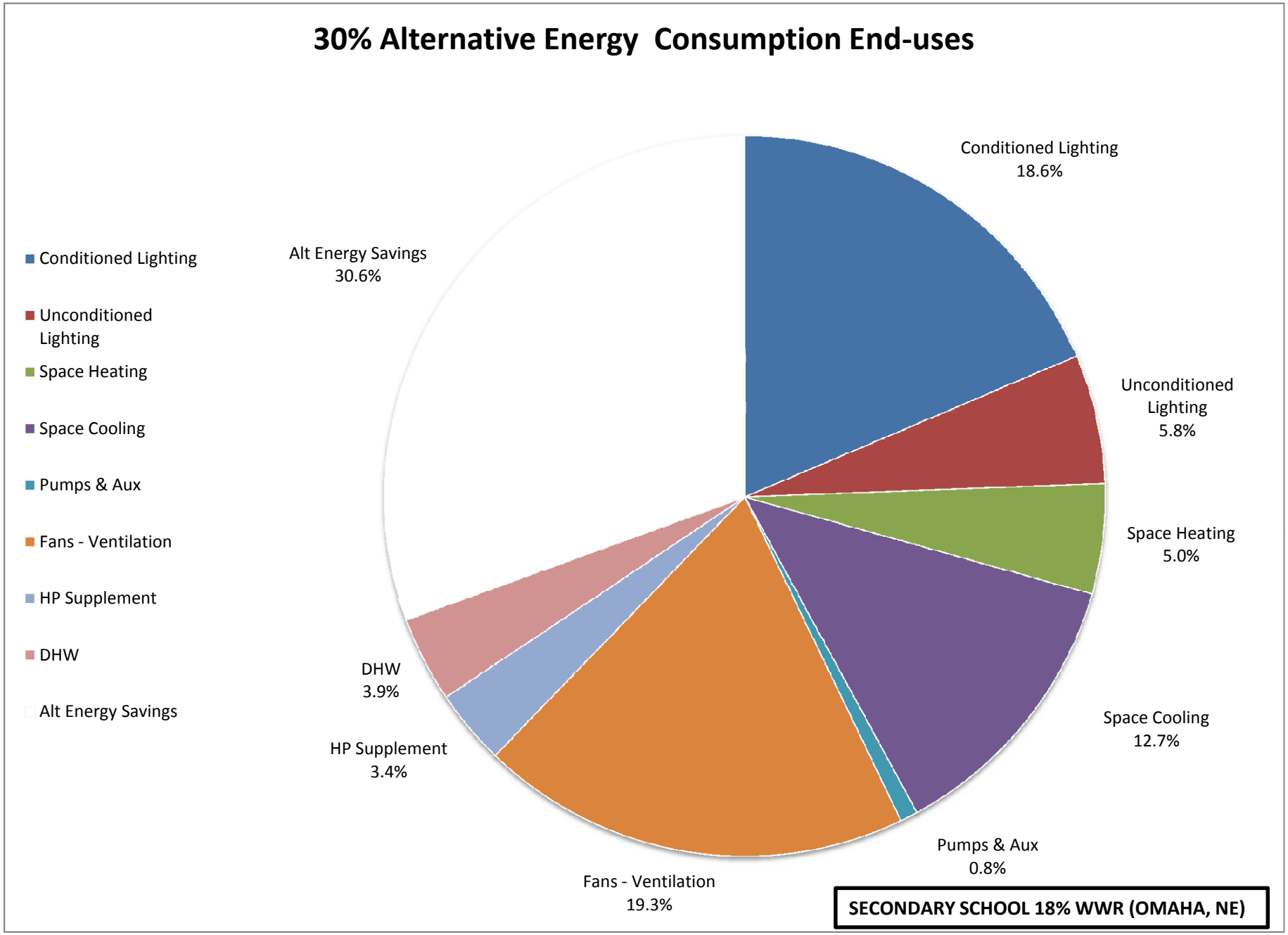
Building Energy Performance Summary - Base Case

End Use	*Energy Source*	*Baseline Building*		*Baseline Building +90*		*Baseline Building +180*		*Baseline Building +270*		Baseline Average		*% End Use of Baseline*
		Energy [MMbtu]	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	
Conditioned Lighting	Electricity	775.2	94.2	775.2	94.2	775.2	94.2	775.2	94.2	775.2	94.2	14.1%
Unconditioned Lighting	Electricity	241.4	16.4	241.4	16.4	241.4	16.4	241.4	16.4	241.4	16.4	4.4%
Misc Equipment	Electricity	1344.3	163.6	1344.3	163.6	1344.3	163.6	1344.3	163.6	1344.3	163.6	24.4%
Space Heating	Electricity	1536.8	950.0	1511.4	941.7	1526.8	943.1	1519.5	946.0	1523.6	945.2	27.7%
Space Heating	Gas									0.0	0.0	0.0%
Space Heating	Steam/ HW									0.0	0.0	0.0%
Space Cooling	Electricity	954.6	386.9	939.6	385.2	950.4	385.8	938.8	385.1	945.9	385.7	17.2%
Space Cooling	CHW									0.0	0.0	0.0%
Heat Rejection	Electricity									0.0	0.0	0.0%
Pumps & Aux	Electricity	1.5	0.2	1.5	0.2	1.5	0.2	1.5	0.2	1.5	0.2	0.0%
Fans - Ventilation	Electricity	373.3	55.5	365.8	54.4	370.3	54.5	364.8	54.6	368.6	54.7	6.7%
Fans - Exhaust	Electricity									0.0	0.0	0.0%
Refrigeration	Electricity									0.0	0.0	0.0%
HP Supplement	Electricity									0.0	0.0	0.0%
DHW	Elec									0.0	0.0	0.0%
DHW	Gas	309.6	1.5	309.6	1.5	309.6	1.5	309.7	1.5	309.6	1.5	5.6%
Total w/o Misc Equipment		4192.4		4144.5		4175.2		4150.9		4165.8		
Total w/ Misc Equipment		5536.7		5488.8		5519.5		5495.2		5510.1		

Energy Cost Summary

Energy Source	*Baseline Cost*	*Baseline Cost +90*	*Baseline Cost +180*	*Baseline Cost +270*	**Baseline Average**
Electricity*	$78,847	$77,943	$78,533	$78,079	**$78,350**
Gas	$3,033	$3,033	$3,033	$3,034	**$3,033**
Steam/ HW					**$0**
Chilled Water					**$0**
Total	**$81,880**	**$80,976**	**$81,566**	**$81,113**	**$81,384**

*Electricity cost excludes Misc Equipment consumption cost (based upon virtual rate)
DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms


30% Alternative Energy Consumption End-uses
Conditioned Lighting
Unconditioned Lighting
Space Heating
Space Cooling
Pumps & Aux
Fans - Ventilation
HP Supplement
DHW
Alt Energy Savings
Conditioned Lighting 18.6%
Unconditioned Lighting 5.8%
Space Heating 5.0%
Space Cooling 12.7%
Pumps & Aux 0.8%
Fans - Ventilation 19.3%
HP Supplement 3.4%
DHW 3.9%
Alt Energy Savings 30.6%
SECONDARY SCHOOL 18% WWR (OMAHA, NE)

Secondary School 18% WWR Energy Results Summary
Omaha, NE

Description: 2.00 CEE Tier 1 Equipment Efficiency, ERV, R-20ci Roof, R-13 + 7.5ci Wall, Glazing U-0.402 and SHGC = 0.270

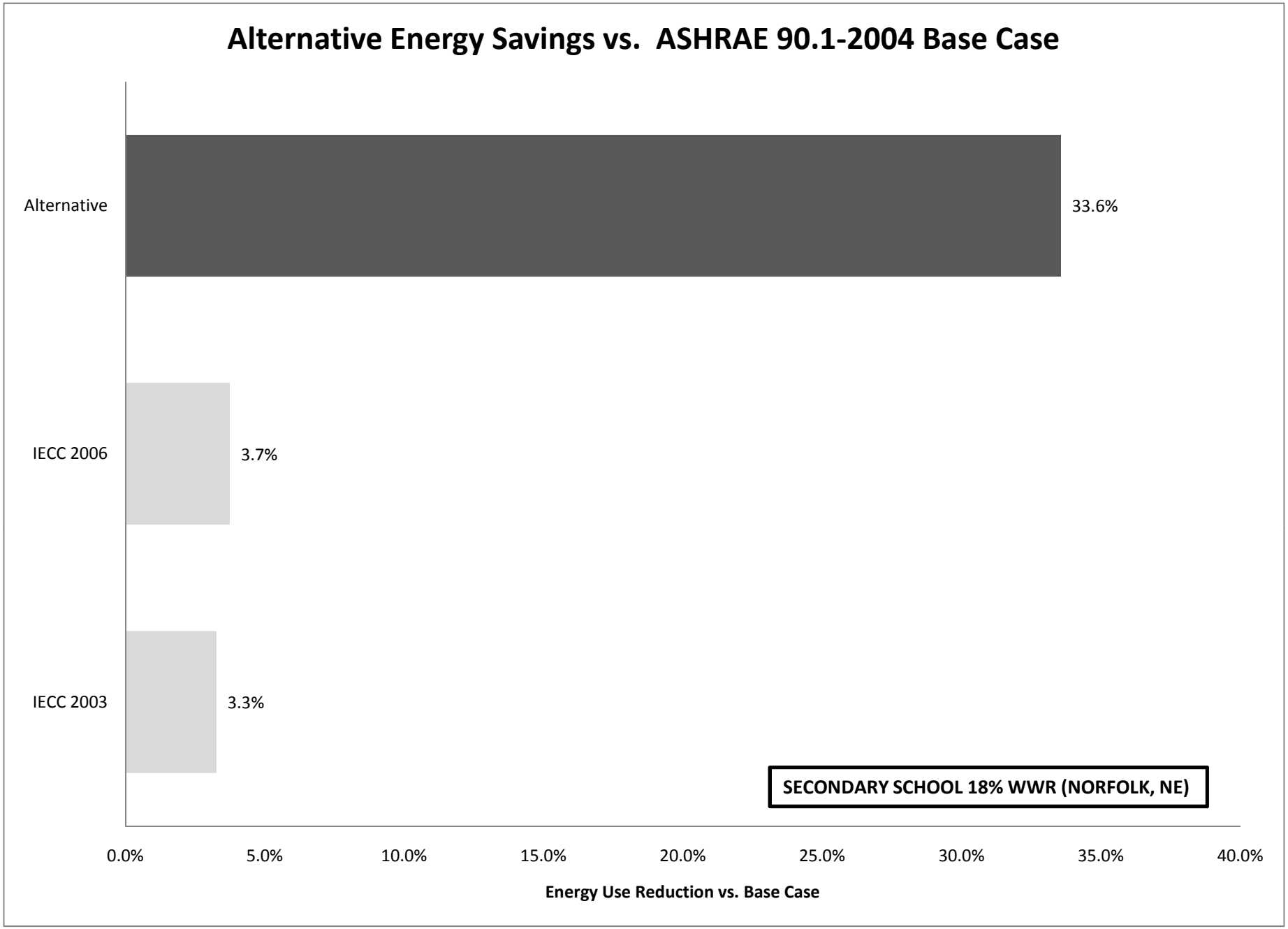
Building Energy Performance Summary - Alternative

End Use	*Energy Source*	*Alternative Building*		*Average Baseline*		*Energy Difference Alt-Baseline*	*% of End Use of As Designed*	*Baseline Consumption Average*
		Energy [MMBtu]	*Peak [kW or therm/hr]*	*Energy [MMBtu]*	*Peak [kW or therm/hr]*	*[%]*	*[%]*	*[%]*
Conditioned Lighting	Electricity	775.2	94.2	775.2	94.2	0.0%	18.3%	14.1%
Unconditioned Lighting	Electricity	241.4	16.4	241.4	16.4	0.0%	5.7%	4.4%
Misc Equipment	Electricity	1344.3	163.6	1344.3	163.6	0.0%	31.7%	24.4%
Space Heating	Electricity	206.3	207.6	1523.6	945.2	86.5%	4.9%	27.7%
Space Heating	Gas			0.0	0.0		0.0%	0.0%
Space Heating	Steam/ HW			0.0	0.0		0.0%	0.0%
Space Cooling	Elec	529.9	241.7	945.9	385.7	44.0%	12.5%	17.2%
Space Cooling	Chilled Water			0.0	0.0		0.0%	0.0%
Heat Rejection	Electricity			0.0	0.0		0.0%	0.0%
Pumps & Aux	Electricity	32.9	4.0	1.5	0.2	-2093.3%	0.8%	0.0%
Fans - Ventilation	Electricity	804.8	83.2	368.6	54.7	-118.4%	19.0%	6.7%
Fans - Exhaust	Electricity			0.0	0.0		0.0%	0.0%
Refrigeration	Electricity			0.0	0.0		0.0%	0.0%
HP Supplement	Electricity	141.0	530.7	0.0	0.0		3.3%	0.0%
DHW	Elec	161.2	29.9	0.0	0.0		3.8%	0.0%
DHW	Gas			309.6	1.5	100.0%	0.0%	5.6%
Total w/o Misc Equipment		**2892.7**		**4165.8**		**30.6%**	100.0%	100.0%
Alt Energy Savings		**1273.1**						
Total w/ Misc Equipment		4237.0		5510.1		23.1%		

Energy Cost Summary

Energy Source	*As Designed Cost*	*Baseline Cost*
Electricity*	$59,625	$78,350
Gas		$3,033
Steam/ HW		$0
Chilled Water		$0
Total	**$59,625**	**$81,384**

*Electricity cost excludes Misc Equipment consumption cost (based upon virtual rate)
DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-F; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms

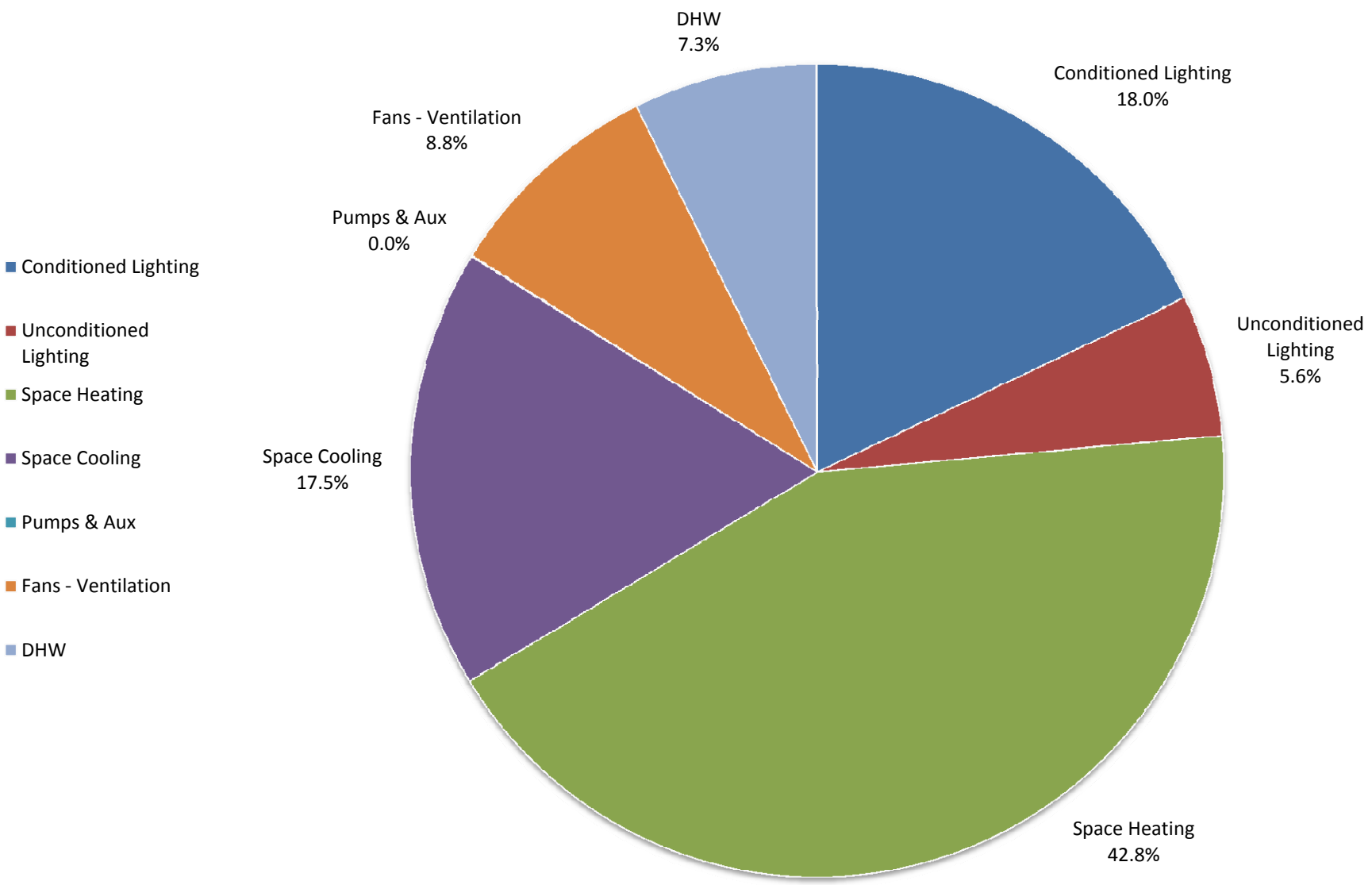

Alternative Energy Savings vs. ASHRAE 90.1-2004 Base Case
Alternative
33.6%
IECC 2006
3.7%
IECC 2003
3.3%
SECONDARY SCHOOL 18% WWR (NORFOLK, NE)
0.0%
5.0%
10.0%
15.0%
20.0%
25.0%
30.0%
35.0%
40.0%
Energy Use Reduction vs. Base Case

Secondary School 18% WWR Energy Results Summary
Norfolk, NE

Run	Name	Annual Energy Use* [MMBtu]	Annual Energy Cost [$]	Cost Savings vs. Avg. Base [$]	Cost Savings vs Avg. Base [%]	Energy Use Reduction vs. Base* [MMBtu]	Energy Use Reduction vs. Base* [%]	Notes
0.00	Base Case Base +90° Base +180° Base +270° Avg Base Case	4338.3 4297.2 4307.8 4301.2 4311.1	$74,735 $74,019 $74,206 $74,096 $74,264					ASHRAE 90.1-2004 Baseline Appendix G Walls: U-0.084; Roof: U-0.063; Floors - U-0.052 Windows: U-0.57, SHGC-0.39
1.10	IECC 2003	4170.5	$72,104	$2,160	2.9%	140.6	3.3%	1.10: IECC 2003 (Norfolk, Zone 14B)
1.11	IECC 2006	4149.5	$71,622	$2,642	3.6%	161.6	3.7%	1.11: IECC 2006
2.00	Alternative	2864.1	$52,905	$21,359	28.8%	1447.0	33.6%	2.00 CEE Tier 1 Equipment Efficiency, ERV, R-20 Roof, R-13 + 7.5ci Wall, Glazing U-0.402 and SHGC = 0.270

*Reported value excludes Misc Equipment electrical end-use

Baseline Energy Consumption End-uses



SECONDARY SCHOOL 18% WWR (NORFOLK, NE)

Secondary School 18% WWR Energy Results Summary
Norfolk, NE

Building Energy Performance Summary - Base Case

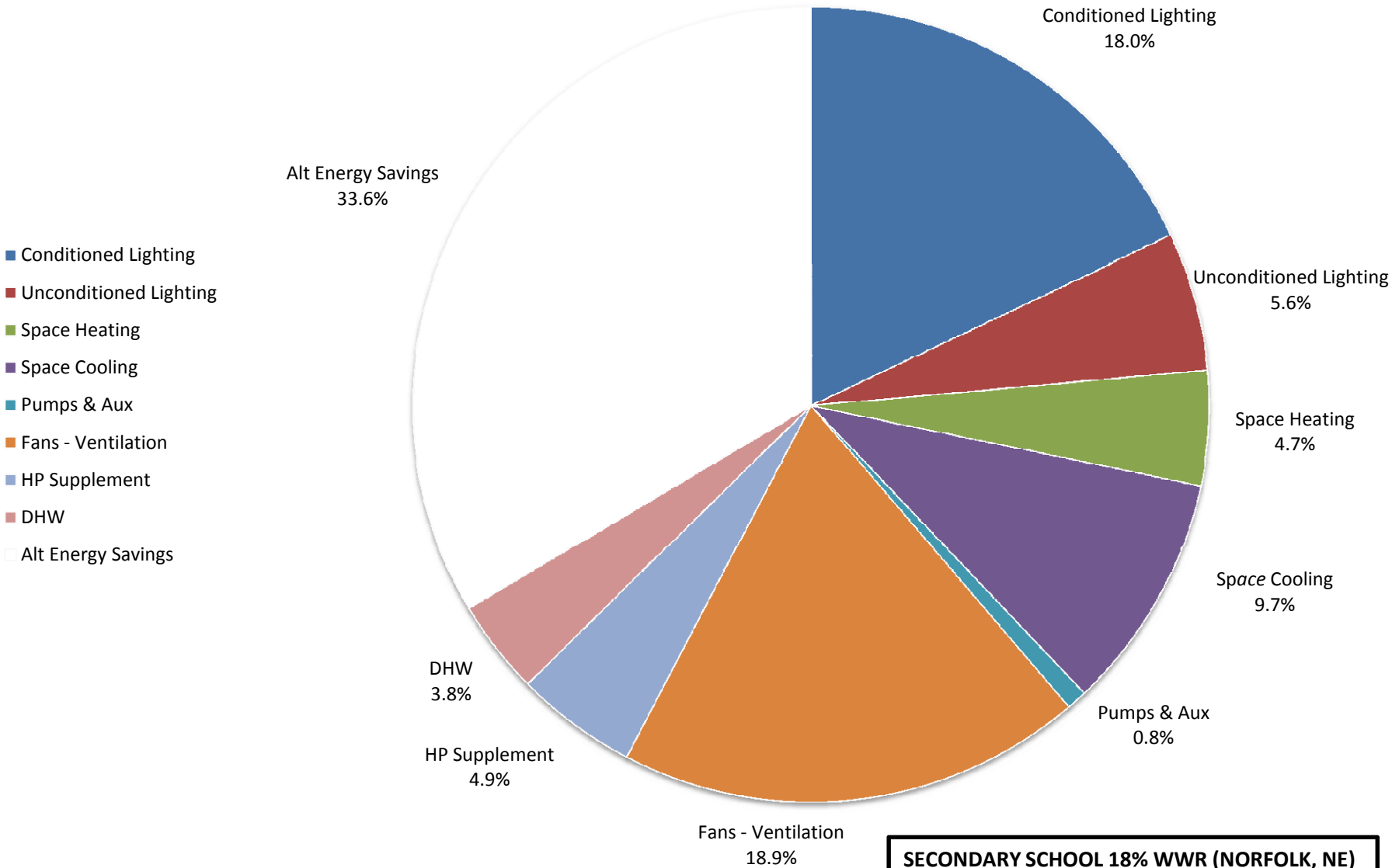
End Use	*Energy Source*	*Baseline Building*		*Baseline Building +90*		*Baseline Building +180*		*Baseline Building +270*		Baseline Average		*% End Use of Baseline*
		Energy [MMbtu]	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	
Conditioned Lighting	Electricity	775.2	94.2	775.2	94.2	775.2	94.2	775.2	94.2	775.2	94.2	13.7%
Unconditioned Lighting	Electricity	241.4	16.4	241.4	16.4	241.4	16.4	241.4	16.4	241.4	16.4	4.3%
Misc Equipment	Electricity	1344.3	163.6	1344.3	163.6	1344.3	163.6	1344.3	163.6	1344.3	163.6	23.8%
Space Heating	Electricity	1856.4	947.7	1834.0	940.4	1840.7	939.7	1841.8	943.6	1843.2	942.8	32.6%
Space Heating	Gas									0.0	0.0	0.0%
Space Heating	Steam/ HW									0.0	0.0	0.0%
Space Cooling	Electricity	763.4	304.3	751.9	303.4	754.3	303.4	749.6	303.3	754.8	303.6	13.3%
Space Cooling	CHW									0.0	0.0	0.0%
Heat Rejection	Electricity									0.0	0.0	0.0%
Pumps & Aux	Electricity	1.6	0.2	1.7	0.2	1.7	0.2	1.7	0.2	1.7	0.2	0.0%
Fans - Ventilation	Electricity	384.6	59.6	377.3	59.2	378.8	59.7	375.7	59.2	379.1	59.4	6.7%
Fans - Exhaust	Electricity									0.0	0.0	0.0%
Refrigeration	Electricity									0.0	0.0	0.0%
HP Supplement	Electricity									0.0	0.0	0.0%
DHW	Elec									0.0	0.0	0.0%
DHW	Gas	315.7	1.5	315.7	1.5	315.7	1.5	315.8	1.5	315.7	1.5	5.6%
Total w/o Misc Equipment		4338.3		4297.2		4307.8		4301.2		4311.1		
Total w/ Misc Equipment		5682.6		5641.5		5652.1		5645.5		5655.4		

Energy Cost Summary

Energy Source	*Baseline Cost*	*Baseline Cost +90*	*Baseline Cost +180*	*Baseline Cost +270*	**Baseline Average**
Electricity*	$71,924	$71,208	$71,395	$71,284	**$71,453**
Gas	$2,811	$2,811	$2,811	$2,812	**$2,811**
Steam/ HW					**$0**
Chilled Water					**$0**
Total	**$74,735**	**$74,019**	**$74,206**	**$74,096**	**$74,264**

*Electricity cost excludes Misc Equipment consumption cost (based upon virtual rate)
DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms

30% Alternative Energy Consumption End-uses



SECONDARY SCHOOL 18% WWR (NORFOLK, NE)

Secondary School 18% WWR Energy Results Summary
Norfolk, NE

Description: 2.00 CEE Tier 1 Equipment Efficiency, ERV, R-20 Roof, R-13 + 7.5ci Wall, Glazing U-0.402 and SHGC = 0.270

Building Energy Performance Summary - Alternative

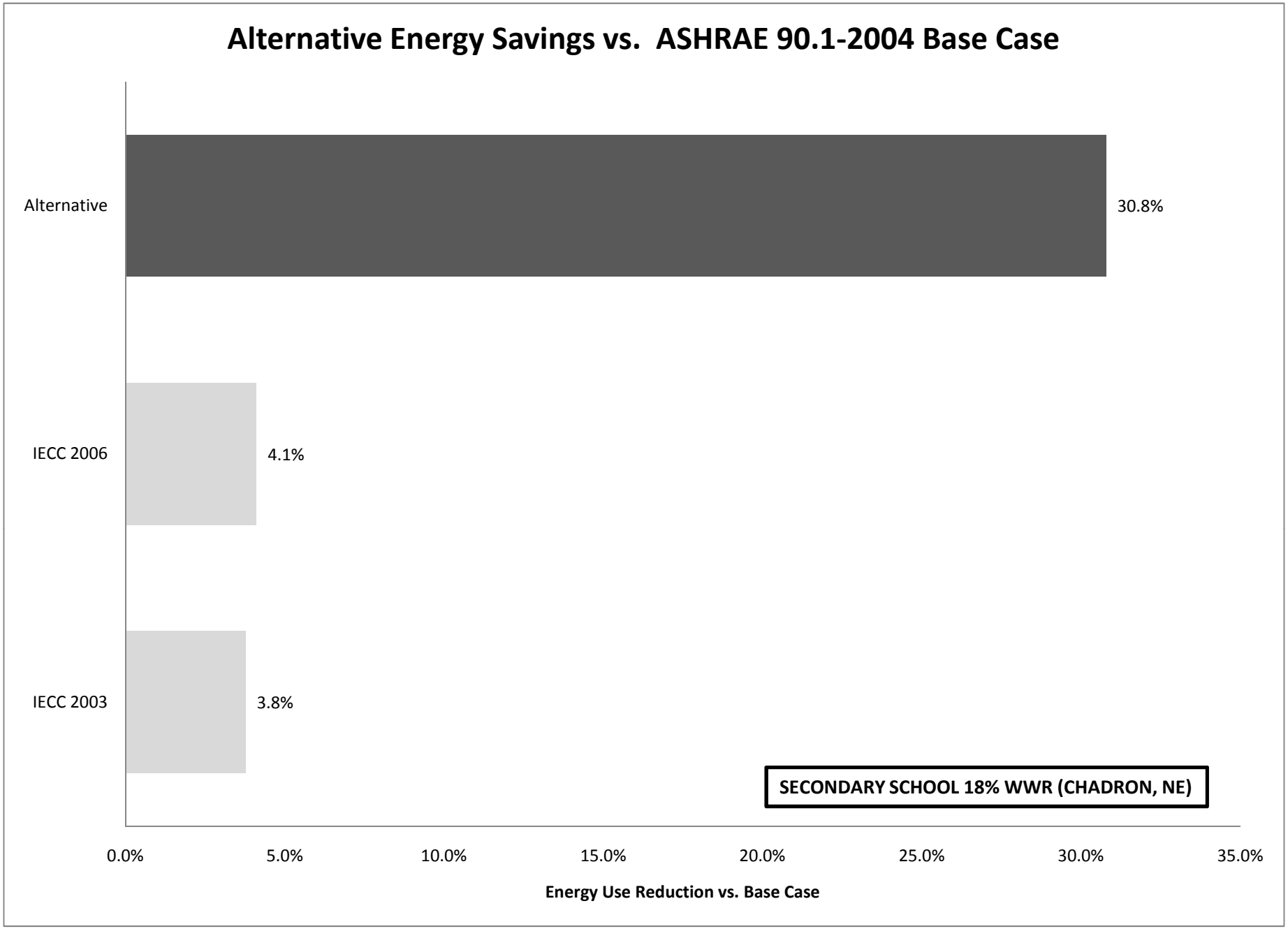
End Use	*Energy Source*	*Alternative Building*		*Average Baseline*		*Energy Difference Alt-Baseline*	*% of End Use of As Designed*	*Baseline Consumption Average*
		Energy [MMBtu]	*Peak [kW or therm/hr]*	*Energy [MMBtu]*	*Peak [kW or therm/hr]*	*[%]*	*[%]*	*[%]*
Conditioned Lighting	Electricity	775.2	94.2	775.2	94.2	0.0%	18.4%	13.7%
Unconditioned Lighting	Electricity	241.4	16.4	241.4	16.4	0.0%	5.7%	4.3%
Misc Equipment	Electricity	1344.3	163.6	1344.3	163.6	0.0%	31.9%	23.8%
Space Heating	Electricity	201.6	153.7	1843.2	942.8	89.1%	4.8%	32.6%
Space Heating	Gas			0.0	0.0		0.0%	0.0%
Space Heating	Steam/ HW			0.0	0.0		0.0%	0.0%
Space Cooling	Elec	416.9	209.8	754.8	303.6	44.8%	9.9%	13.3%
Space Cooling	Chilled Water			0.0	0.0		0.0%	0.0%
Heat Rejection	Electricity			0.0	0.0		0.0%	0.0%
Pumps & Aux	Electricity	35.7	4.0	1.7	0.2	-2031.3%	0.8%	0.0%
Fans - Ventilation	Electricity	814.5	82.5	379.1	59.4	-114.9%	19.4%	6.7%
Fans - Exhaust	Electricity			0.0	0.0		0.0%	0.0%
Refrigeration	Electricity			0.0	0.0		0.0%	0.0%
HP Supplement	Electricity	213.1	590.6	0.0	0.0		5.1%	0.0%
DHW	Elec	165.7	31.1	0.0	0.0		3.9%	0.0%
DHW	Gas			315.7	1.5	100.0%	0.0%	5.6%
Total w/o Misc Equipment		**2864.1**		**4311.1**		**33.6%**	100.0%	100.0%
Alt Energy Savings		**1447.0**						
Total w/ Misc Equipment		4208.4		5655.4		25.6%		

Energy Cost Summary

Energy Source	*As Designed Cost*	*Baseline Cost*
Electricity*	$52,905	$71,453
Gas		$2,811
Steam/ HW		$0
Chilled Water		$0
Total	**$52,905**	**$74,264**

*Electricity cost excludes Misc Equipment consumption cost (based upon virtual rate)

DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-F; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms

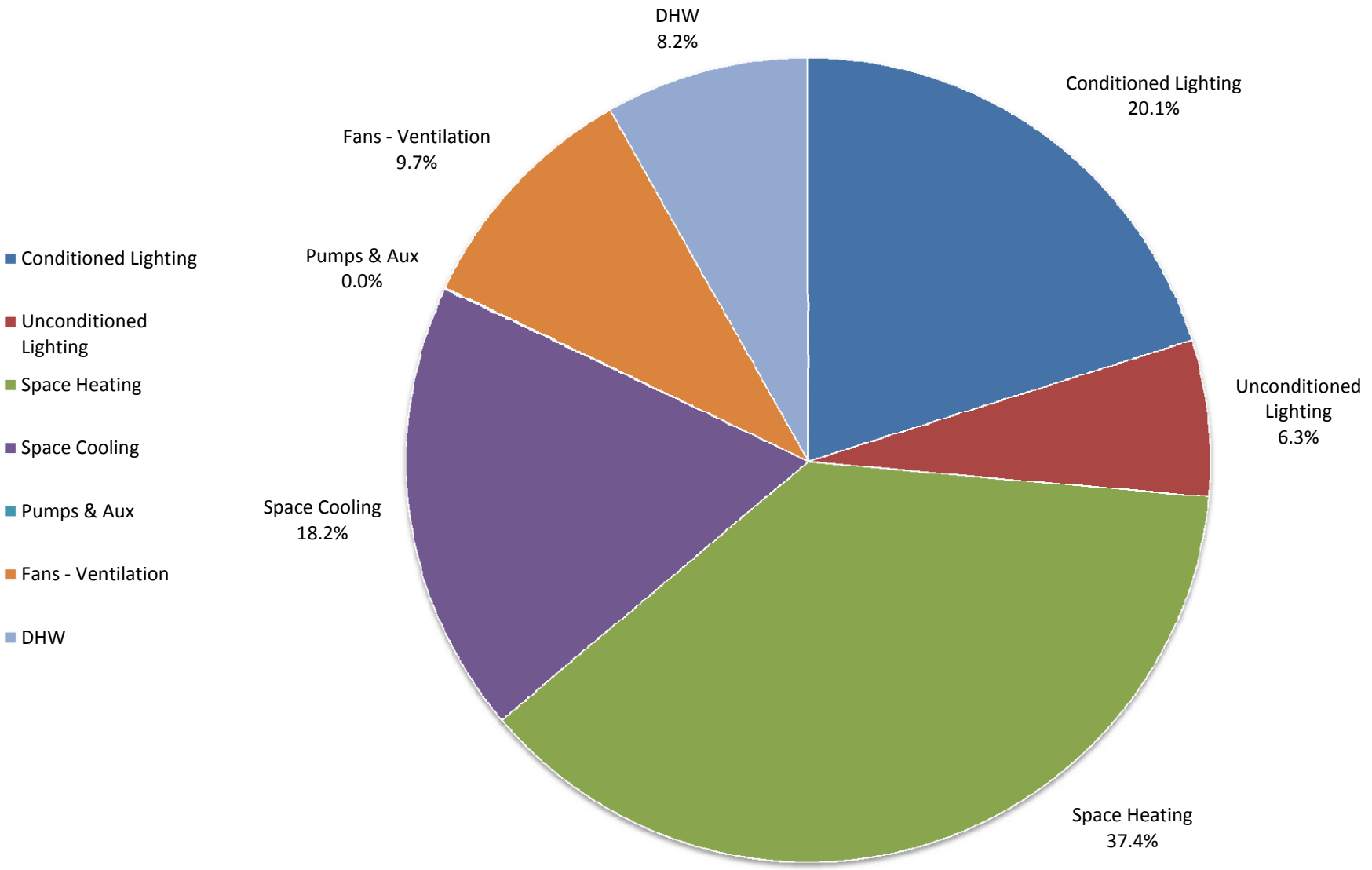

Alternative Energy Savings vs. ASHRAE 90.1-2004 Base Case
Alternative
30.8%
IECC 2006
4.1%
IECC 2003
3.8%
SECONDARY SCHOOL 18% WWR (CHADRON, NE)
0.0%
5.0%
10.0%
15.0%
20.0%
25.0%
30.0%
35.0%
Energy Use Reduction vs. Base Case

Secondary School 18% WWR Energy Results Summary
Chadron, NE

Run	Name	Annual Energy Use* [MMBtu]	Annual Energy Cost [$]	Cost Savings vs. Avg. Base [$]	Cost Savings vs Avg. Base [%]	Energy Use Reduction vs. Base* [MMBtu]	Energy Use Reduction vs. Base* [%]	Notes
0.00	Base Case Base +90° Base +180° Base +270° Avg Base Case	3878.8 3830.6 3855.7 3835.8 3850.2	$66,914 $66,107 $66,536 $66,197 $66,439					ASHRAE 90.1-2004 Baseline Appendix G Walls: U-0.084; Roof: U-0.063; Floors - U-0.052 Windows: U-0.57, SHGC-0.39
1.10	IECC 2003	3704.8	$64,152	$2,287	3.4%	145.4	3.8%	1.10: IECC 2003 (Chadron, Zone 15)
1.11	IECC 2006	3691.5	$63,820	$2,619	3.9%	158.7	4.1%	1.11: IECC 2006
2.00	Alternative	2664.8	$49,546	$16,893	25.4%	1185.4	30.8%	2.00 CEE Tier 1 Equipment Efficiency, ERV, R-20ci Roof, R-13 + 7.5ci Wall, Glazing U-0.402 and SHGC = 0.270

*Reported value excludes Misc Equipment electrical end-use

Baseline Energy Consumption End-uses



SECONDARY SCHOOL 18% WWR (CHADRON,NE)

Secondary School 18% WWR Energy Results Summary
Chadron, NE

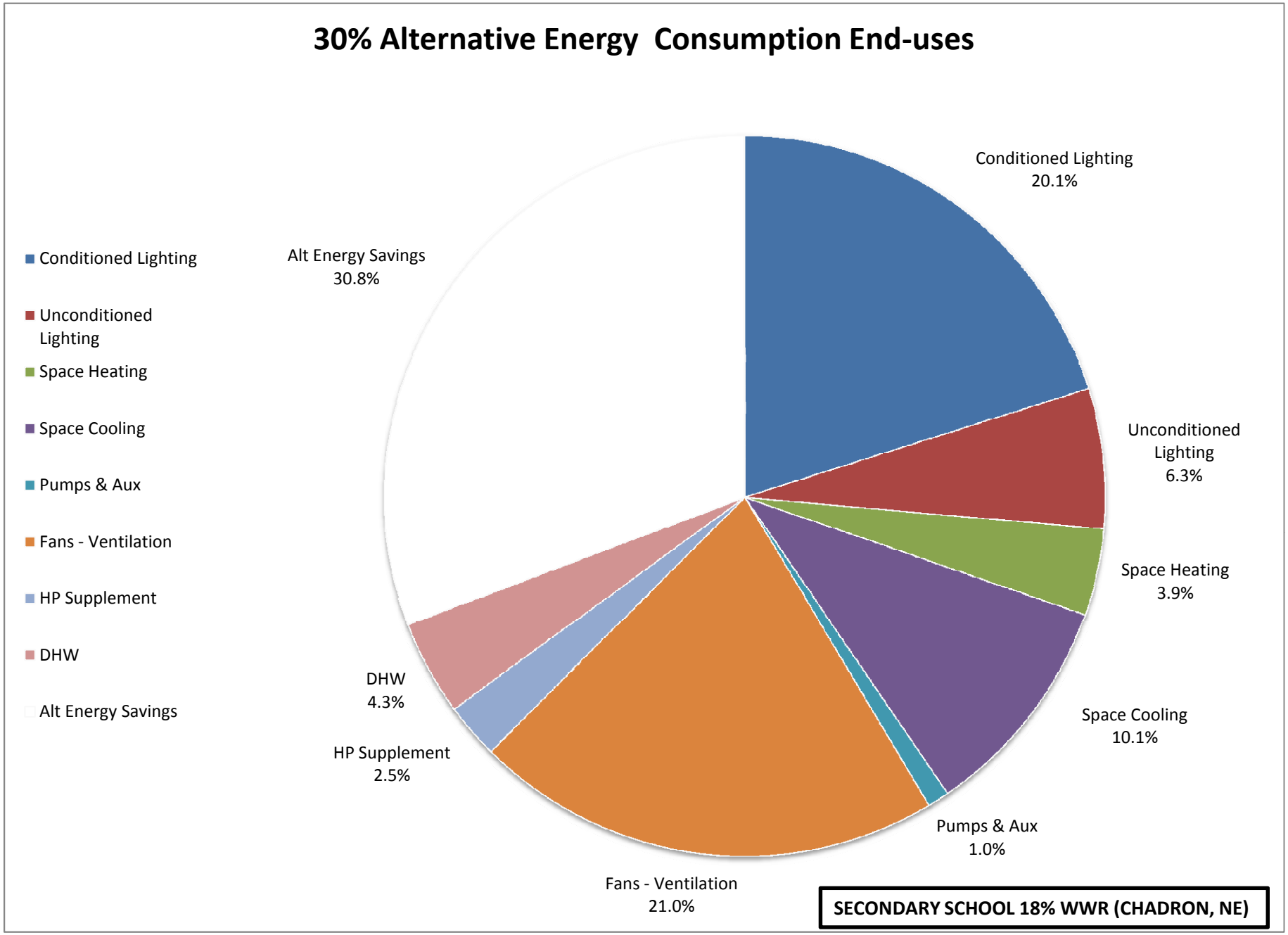
Building Energy Performance Summary - Base Case

End Use	*Energy Source*	*Baseline Building*		*Baseline Building +90*		*Baseline Building +180*		*Baseline Building +270*		Baseline Average		*% End Use of Baseline*
		Energy [MMbtu]	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	
Conditioned Lighting	Electricity	775.2	94.2	775.2	94.2	775.2	94.2	775.2	94.2	775.2	94.2	14.9%
Unconditioned Lighting	Electricity	241.4	16.4	241.4	16.4	241.4	16.4	241.4	16.4	241.4	16.4	4.6%
Misc Equipment	Electricity	1344.3	163.6	1344.3	163.6	1344.3	163.6	1344.3	163.6	1344.3	163.6	25.9%
Space Heating	Electricity	1452.4	843.0	1429.2	834.9	1439.3	834.5	1438.7	840.4	1439.9	838.2	27.7%
Space Heating	Gas									0.0	0.0	0.0%
Space Heating	Steam/ HW									0.0	0.0	0.0%
Space Cooling	Electricity	712.4	285.1	696.4	283.4	706.6	284.9	693.3	283.2	702.2	284.2	13.5%
Space Cooling	CHW									0.0	0.0	0.0%
Heat Rejection	Electricity									0.0	0.0	0.0%
Pumps & Aux	Electricity	1.8	0.2	1.9	0.2	1.9	0.2	1.9	0.2	1.9	0.2	0.0%
Fans - Ventilation	Electricity	380.3	55.5	371.2	54.0	376.0	55.2	370.0	53.8	374.4	54.6	7.2%
Fans - Exhaust	Electricity									0.0	0.0	0.0%
Refrigeration	Electricity									0.0	0.0	0.0%
HP Supplement	Electricity									0.0	0.0	0.0%
DHW	Elec									0.0	0.0	0.0%
DHW	Gas	315.3	1.5	315.3	1.5	315.3	1.5	315.3	1.5	315.3	1.5	6.1%
Total w/o Misc Equipment		3878.8		3830.6		3855.7		3835.8		3850.2		
Total w/ Misc Equipment		5223.1		5174.9		5200.0		5180.1		5194.5		

Energy Cost Summary

Energy Source	*Baseline Cost*	*Baseline Cost +90*	*Baseline Cost +180*	*Baseline Cost +270*	**Baseline Average**
Electricity*	$64,184	$63,377	$63,806	$63,466	**$63,709**
Gas	$2,730	$2,730	$2,730	$2,731	**$2,730**
Steam/ HW					**$0**
Chilled Water					**$0**
Total	**$66,914**	**$66,107**	**$66,536**	**$66,197**	**$66,439**

*Electricity cost excludes Misc Equipment consumption cost (based upon virtual rate)
DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms


30% Alternative Energy Consumption End-uses
Conditioned Lighting
Unconditioned Lighting
Space Heating
Space Cooling
Pumps & Aux
Fans - Ventilation
HP Supplement
DHW
Alt Energy Savings
Conditioned Lighting 20.1%
Unconditioned Lighting 6.3%
Space Heating 3.9%
Space Cooling 10.1%
Pumps & Aux 1.0%
Fans - Ventilation 21.0%
HP Supplement 2.5%
DHW 4.3%
Alt Energy Savings 30.8%
SECONDARY SCHOOL 18% WWR (CHADRON, NE)

Secondary School 18% WWR Energy Results Summary
Chadron, NE

Description: 2.00 CEE Tier 1 Equipment Efficiency, ERV, R-20ci Roof, R-13 + 7.5ci Wall, Glazing U-0.402 and SHGC = 0.270

Building Energy Performance Summary - Alternative

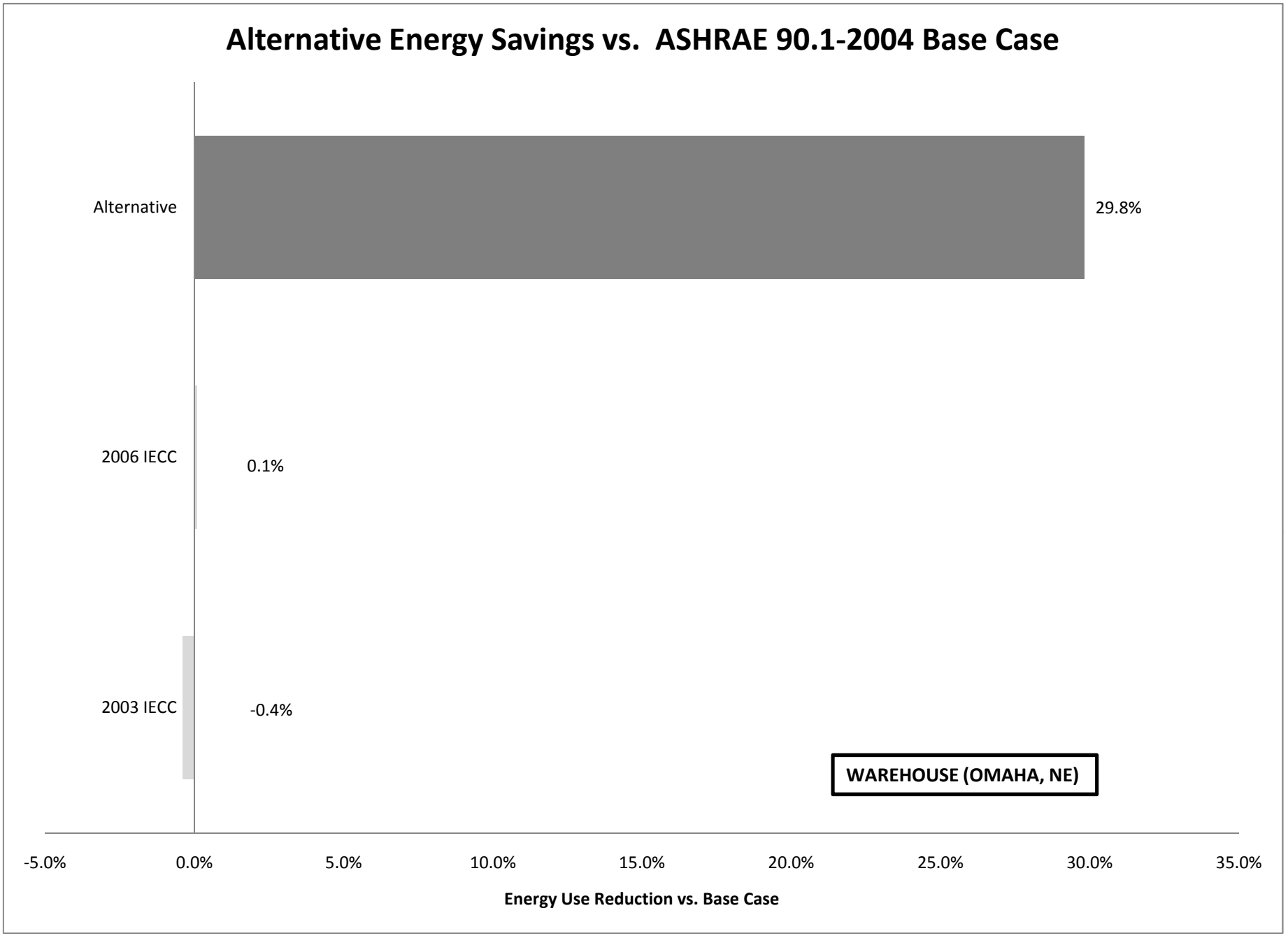
End Use	*Energy Source*	*Alternative Building*		*Average Baseline*		*Energy Difference Alt-Baseline*	*% of End Use of As Designed*	*Baseline Consumption Average*
		Energy [MMBtu]	*Peak [kW or therm/hr]*	*Energy [MMBtu]*	*Peak [kW or therm/hr]*	*[%]*	*[%]*	*[%]*
Conditioned Lighting	Electricity	775.2	94.2	775.2	94.2	0.0%	19.3%	14.9%
Unconditioned Lighting	Electricity	241.4	16.4	241.4	16.4	0.0%	6.0%	4.6%
Misc Equipment	Electricity	1344.3	163.6	1344.3	163.6	0.0%	33.5%	25.9%
Space Heating	Electricity	151.4	167.9	1439.9	838.2	89.5%	3.8%	27.7%
Space Heating	Gas			0.0	0.0		0.0%	0.0%
Space Heating	Steam/ HW			0.0	0.0		0.0%	0.0%
Space Cooling	Elec	390.2	205.2	702.2	284.2	44.4%	9.7%	13.5%
Space Cooling	Chilled Water			0.0	0.0		0.0%	0.0%
Heat Rejection	Electricity			0.0	0.0		0.0%	0.0%
Pumps & Aux	Electricity	37.5	4.0	1.9	0.2	-1900.0%	0.9%	0.0%
Fans - Ventilation	Electricity	808.0	82.7	374.4	54.6	-115.8%	20.2%	7.2%
Fans - Exhaust	Electricity			0.0	0.0		0.0%	0.0%
Refrigeration	Electricity			0.0	0.0		0.0%	0.0%
HP Supplement	Electricity	95.8	506.6	0.0	0.0		2.4%	0.0%
DHW	Elec	165.3	30.1	0.0	0.0		4.1%	0.0%
DHW	Gas			315.3	1.5	100.0%	0.0%	6.1%
Total w/o Misc Equipment		**2664.8**		**3850.2**		**30.8%**	100.0%	100.0%
Alt Energy Savings		**1185.4**						
Total w/ Misc Equipment		4009.1		5194.5		22.8%		

Energy Cost Summary

Energy Source	*As Designed Cost*	*Baseline Cost*
Electricity*	$49,546	$63,709
Gas		$2,730
Steam/ HW		$0
Chilled Water		$0
Total	**$49,546**	**$66,439**

*Electricity cost excludes Misc Equipment consumption cost (based upon virtual rate)

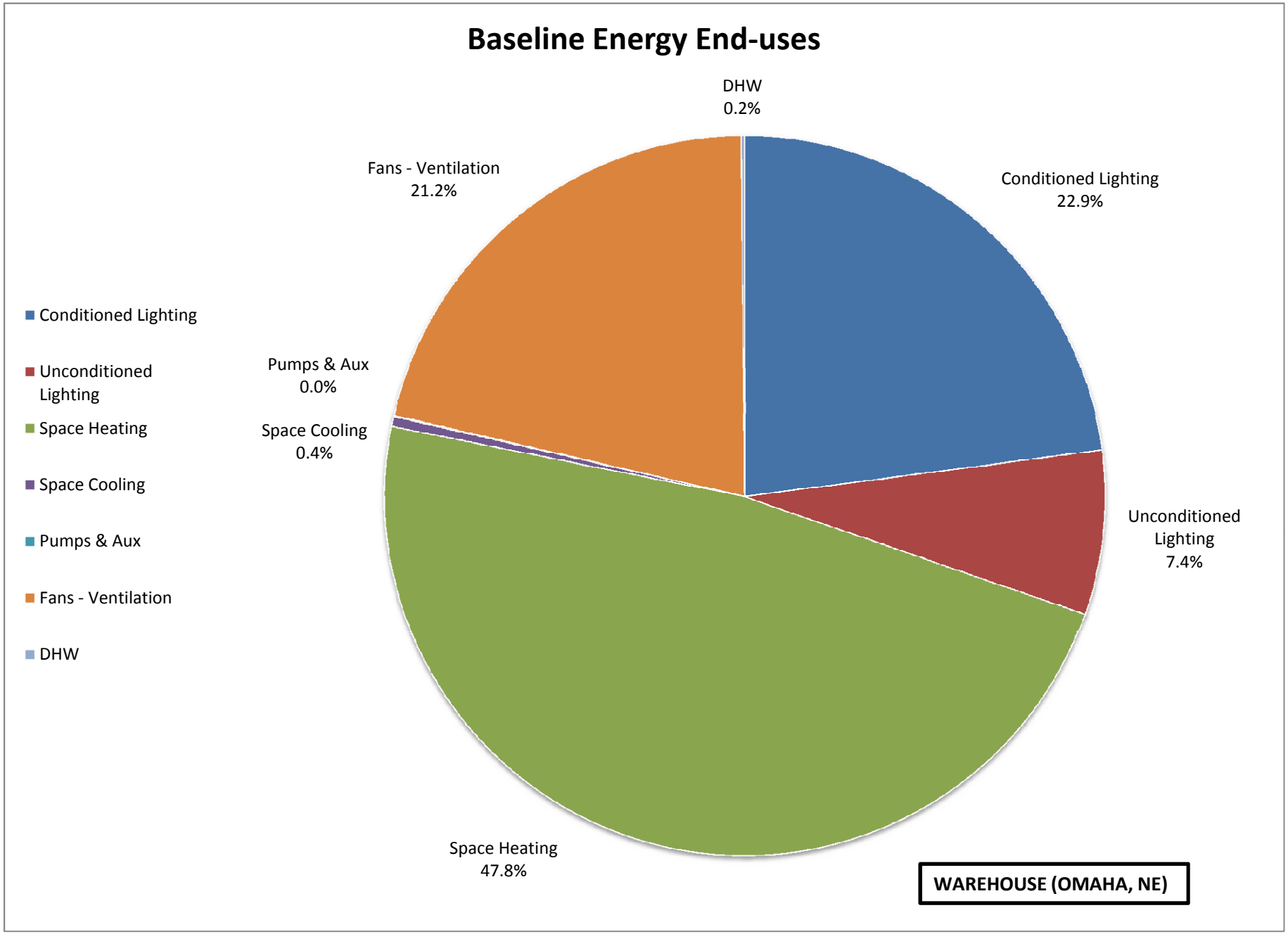
DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-F; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms


Alternative Energy Savings vs. ASHRAE 90.1-2004 Base Case
Alternative
29.8%
2006 IECC
0.1%
2003 IECC
-0.4%
WAREHOUSE (OMAHA, NE)
-5.0%
0.0%
5.0%
10.0%
15.0%
20.0%
25.0%
30.0%
35.0%
Energy Use Reduction vs. Base Case

Warehouse Energy Results Summary
Omaha, NE

Run	Name	Annual Energy Use* [MMBtu]	Annual Energy Cost* [$]	Cost Savings vs. Avg. Base* [$]	Savings vs Avg. Base* [%]	Energy Use Reduction vs. Base* [MMBtu]	Energy Use Reduction vs. Base* [%]	Notes
0.00	Base Case	1408.8	$20,553					
	Base +90°	1415.4	$20,594					ASHRAE 90.1-2004 Baseline
	Base +180°	1414.8	$20,571					Appendix G
	Base +270°	1408.3	$20,533					Walls: U-0.084; Roof: U-0.063; Floors - U-0.052
	Avg Base Case	1411.825	$20,563					Windows: U-0.57, SHGC-0.39
1.10	2003 IECC	1417.4	$20,688	-$125	-0.6%	-5.58	-0.4%	2003 IECC
1.11	2006 IECC	1410.6	$20,583	-$20	-0.1%	1.22	0.1%	2006 IECC
3.42	As Designed	990.8	$16,280	$4,283	20.8%	421.03	29.8%	Alternative

*Reported excluding Misc Equipment electrical end-use


Baseline Energy End-uses
DHW
0.2%
Fans - Ventilation
21.2%
Conditioned Lighting
22.9%
Conditioned Lighting
Unconditioned Lighting
Space Heating
Space Cooling
Pumps & Aux
Fans - Ventilation
DHW
Pumps & Aux
0.0%
Space Cooling
0.4%
Unconditioned Lighting
7.4%
Space Heating
47.8%
WAREHOUSE (OMAHA, NE)

Warehouse Energy Results Summary
Omaha, NE

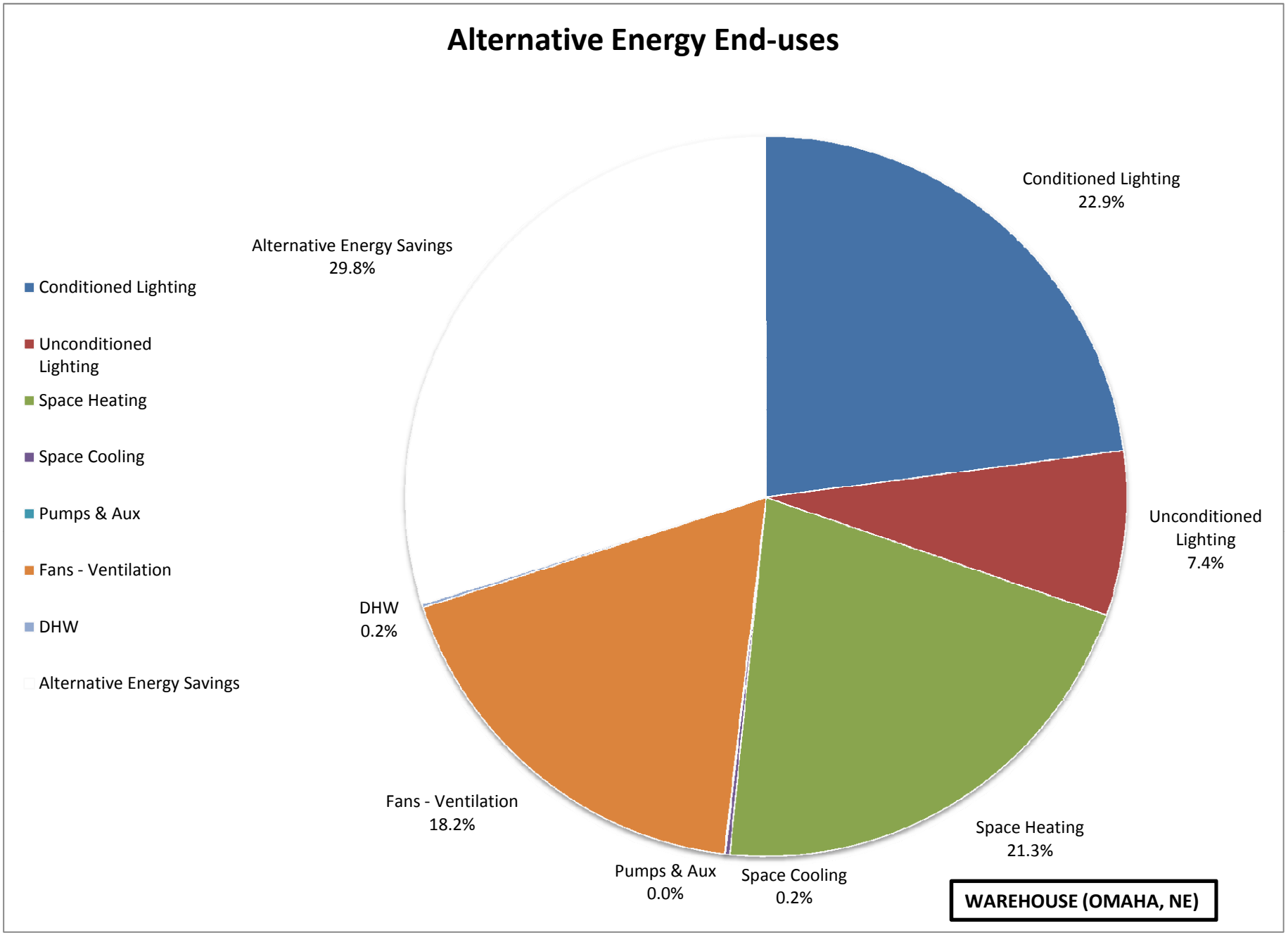
Building Energy Performance Summary - Base Case

End Use	*Energy Source*	*Baseline Building*		*Baseline Building +90*		*Baseline Building +180*		*Baseline Building +270*		Baseline Average		*% End Use of Baseline*
		Energy [MMbtu]	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	
Conditioned Lighting	Electricity	323.7	34.6	323.7	34.6	323.7	34.6	323.7	34.6	323.7	34.6	16.9%
Unconditioned Lighting	Electricity	104.5	1.4	104.5	1.4	104.5	1.4	104.5	1.4	104.5	1.4	5.5%
Misc Equipment	Electricity	503.9	53.9	503.9	53.9	503.9	53.9	503.9	53.9	503.9	53.9	26.3%
Space Heating	Electricity									0.0	0.0	0.0%
Space Heating	Gas	669.7	0.9	678.5	0.9	679.9	0.9	670.9	0.9	674.8	0.9	35.2%
Space Heating	Steam/ HW									0.0	0.0	0.0%
Space Cooling	Electricity	6.8	1.9	6.1	1.8	5.6	1.6	6.5	1.8	6.3	1.8	0.3%
Space Cooling	CHW									0.0	0.0	0.0%
Heat Rejection	Electricity									0.0	0.0	0.0%
Pumps & Aux	Electricity	0.7	0.0	0.7	0.0	0.7	0.0	0.7	0.0	0.7	0.0	0.0%
Fans - Ventilation	Electricity	301.2	25.5	299.7	25.4	298.2	25.3	299.8	25.4	299.7	25.4	15.6%
Fans - Exhaust	Electricity									0.0	0.0	0.0%
Refrigeration	Electricity									0.0	0.0	0.0%
HP Supplement	Electricity									0.0	0.0	0.0%
DHW	Elec									0.0	0.0	0.0%
DHW	Gas	2.2	0.0	2.2	0.0	2.2	0.0	2.2	0.0	2.2	0.0	0.1%
Total w/o Misc Equipment		1408.8		1415.4		1414.8		1408.3		1411.825		
Total w/ Misc Equipment		1912.7		1919.3		1918.7		1912.2		1915.725		

Energy Cost Summary

Energy Source	*Baseline Cost*	*Baseline Cost +90*	*Baseline Cost +180*	*Baseline Cost +270*	**Baseline Average**
Electricity*	$14,034	$13,993	$13,957	$14,002	**$13,997**
Gas	$6,519	$6,601	$6,614	$6,531	**$6,566**
Total	**$20,553**	**$20,594**	**$20,571**	**$20,533**	**$20,563**

*Electricity cost excludes Misc Equipment electrical consumption cost (based upon virtual rate)
DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms


Alternative Energy End-uses
Conditioned Lighting
Unconditioned Lighting
Space Heating
Space Cooling
Pumps & Aux
Fans - Ventilation
DHW
Alternative Energy Savings
Alternative Energy Savings 29.8%
Conditioned Lighting 22.9%
Unconditioned Lighting 7.4%
Space Heating 21.3%
Space Cooling 0.2%
Pumps & Aux 0.0%
Fans - Ventilation 18.2%
DHW 0.2%
WAREHOUSE (OMAHA, NE)

Warehouse Energy Results Summary
Omaha, NE

Description: Alternative

DX split system w/ gas furnace and gas fired radiant heat; 90% eff. furnace; CEE Tier 1; Improved wall; R-40 roof

Building Energy Performance Summary

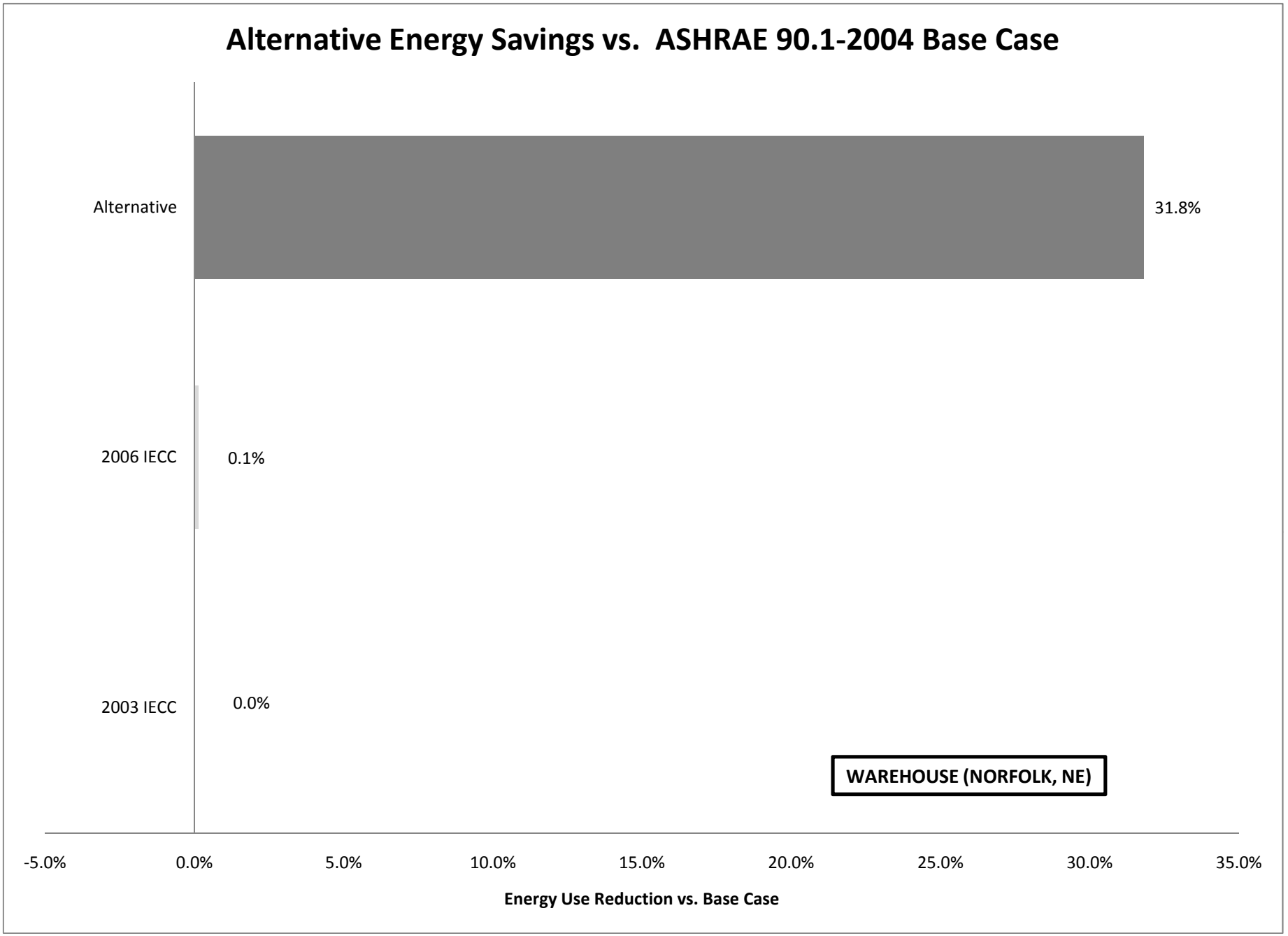
End Use	*Energy Source*	*Alternative Building*		*Average Baseline*		*Energy Difference Alt-Baseline*	*% of End Use of As Designed*	*Baseline Consumption Average*
		Energy [MMBtu]	*Peak [kW or therm/hr]*	*Energy [MMBtu]*	*Peak [kW or therm/hr]*	*[%]*	*[%]*	*[%]*
Conditioned Lighting	Electricity	323.7	34.6	323.7	34.6	0.0%	21.7%	16.9%
Unconditioned Lighting	Electricity	104.5	0.0	104.5	1.4	0.0%	7.0%	5.5%
Misc Equipment	Electricity	503.9	53.9	503.9	53.9	0.0%	33.7%	26.3%
Space Heating	Electricity			0.0	0.0		0.0%	0.0%
Space Heating	Gas	300.3	0.6	674.8	0.9	55.5%	20.1%	35.2%
Space Heating	Steam/ HW			0.0	0.0		0.0%	0.0%
Space Cooling	Elec	2.7	1.6	6.3	1.8	56.8%	0.2%	0.3%
Space Cooling	Chilled Water			0.0	0.0		0.0%	0.0%
Heat Rejection	Electricity			0.0	0.0		0.0%	0.0%
Pumps & Aux	Electricity	0.7	0.0	0.7	0.0	0.0%	0.0%	0.0%
Fans - Ventilation	Electricity	256.7	25.4	299.7	25.4	14.4%	17.2%	15.6%
Fans - Exhaust	Electricity			0.0	0.0		0.0%	0.0%
Refrigeration	Electricity			0.0	0.0		0.0%	0.0%
HP Supplement	Electricity			0.0	0.0		0.0%	0.0%
DHW	Elec			0.0	0.0		0.0%	0.0%
DHW	Gas	2.2	1.4	2.2	0.0	0.0%	0.1%	0.1%
Total w/o Misc Equipment		**990.8**		**1411.8**		**29.8%**	100.0%	100.0%
Alternative Energy Savings		**421.0**						
Total w/ Misc Equipment		1494.7		1915.7				

Energy Cost Summary

Energy Source	*As Designed Cost*	*Baseline Cost*
Electricity*	$13,234	$13,997
Gas	$3,046	$6,566
Total	**$16,280**	**$20,563**

*Electricity cost excludes Misc Equipment electrical consumption cost (based upon virtual rate)

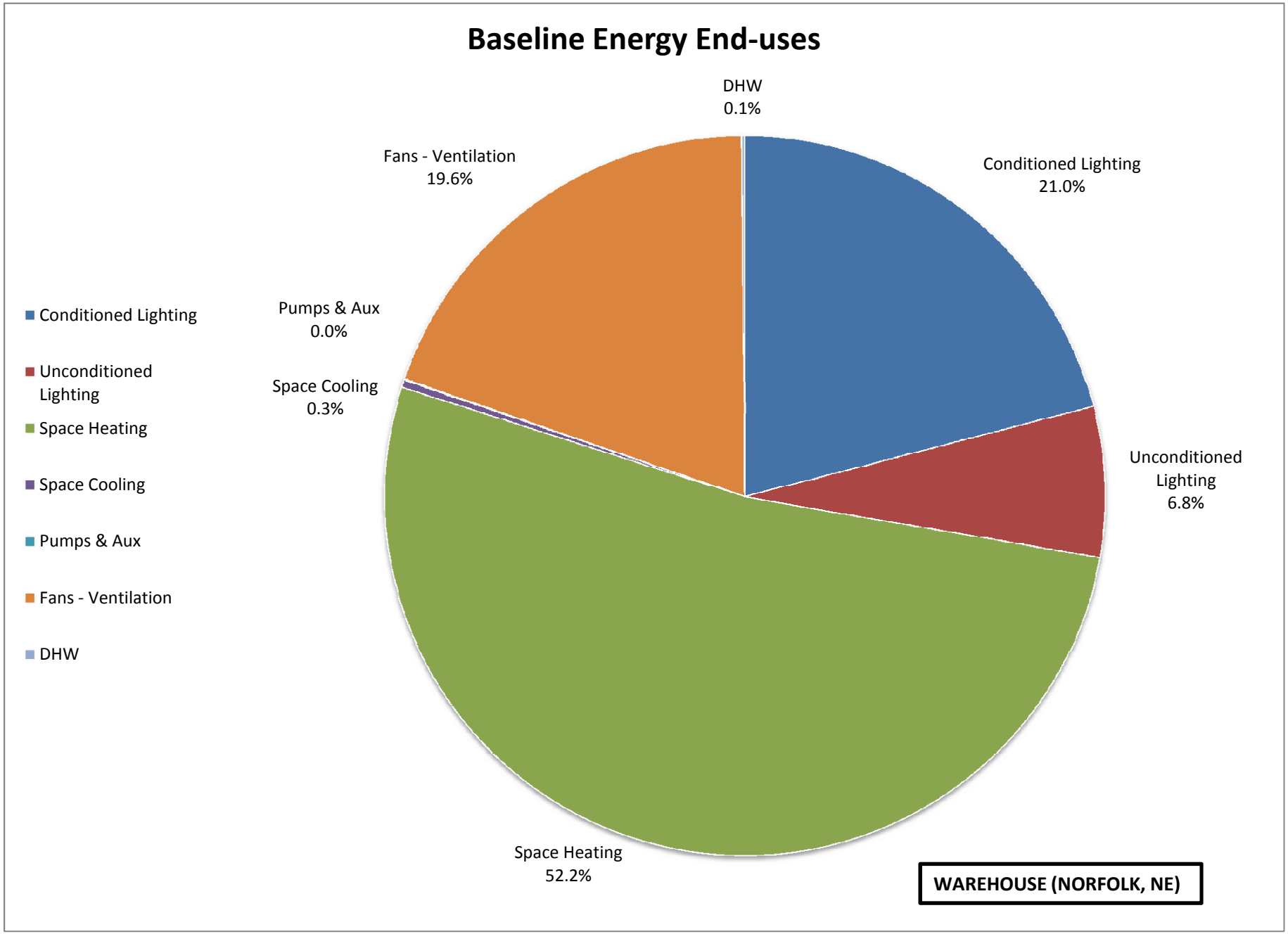
DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms


Alternative Energy Savings vs. ASHRAE 90.1-2004 Base Case
Alternative
31.8%
2006 IECC
0.1%
2003 IECC
0.0%
WAREHOUSE (NORFOLK, NE)
-5.0%
0.0%
5.0%
10.0%
15.0%
20.0%
25.0%
30.0%
35.0%
Energy Use Reduction vs. Base Case

Warehouse Energy Results Summary
Norfolk, NE

Run	Name	Annual Energy Use* [MMBtu]	Annual Energy Cost* [$]	Cost Savings vs. Avg. Base* [$]	Savings vs Avg. Base* [%]	Energy Use Reduction vs. Base* [MMBtu]	Energy Use Reduction vs. Base* [%]	Notes
0.00	Base Case	1540.7	$21,057					
	Base +90°	1548.4	$21,090					ASHRAE 90.1-2004 Baseline
	Base +180°	1547.8	$21,062					Appendix G
	Base +270°	1540.4	$21,034					Walls: U-0.084; Roof: U-0.063; Floors - U-0.052
	Avg Base Case	1544.325	$21,061					Windows: U-0.57, SHGC-0.39
1.10	2003 IECC	1544.6	$21,139	-$78	-0.4%	-0.27	0.0%	2003 IECC
1.11	2006 IECC	1542.3	$21,075	-$14	-0.1%	2.03	0.1%	2006 IECC
3.42	As Designed	1053.1	$16,507	$4,554	21.6%	491.23	31.8%	Alternative

*Reported excluding Misc Equipment electrical end-use


Baseline Energy End-uses
DHW
0.1%
Conditioned Lighting
21.0%
Unconditioned
Lighting
6.8%
Space Heating
52.2%
Space Cooling
0.3%
Pumps & Aux
0.0%
Fans - Ventilation
19.6%
Conditioned Lighting
Unconditioned
Lighting
Space Heating
Space Cooling
Pumps & Aux
Fans - Ventilation
DHW
WAREHOUSE (NORFOLK, NE)

Warehouse Energy Results Summary
Norfolk, NE

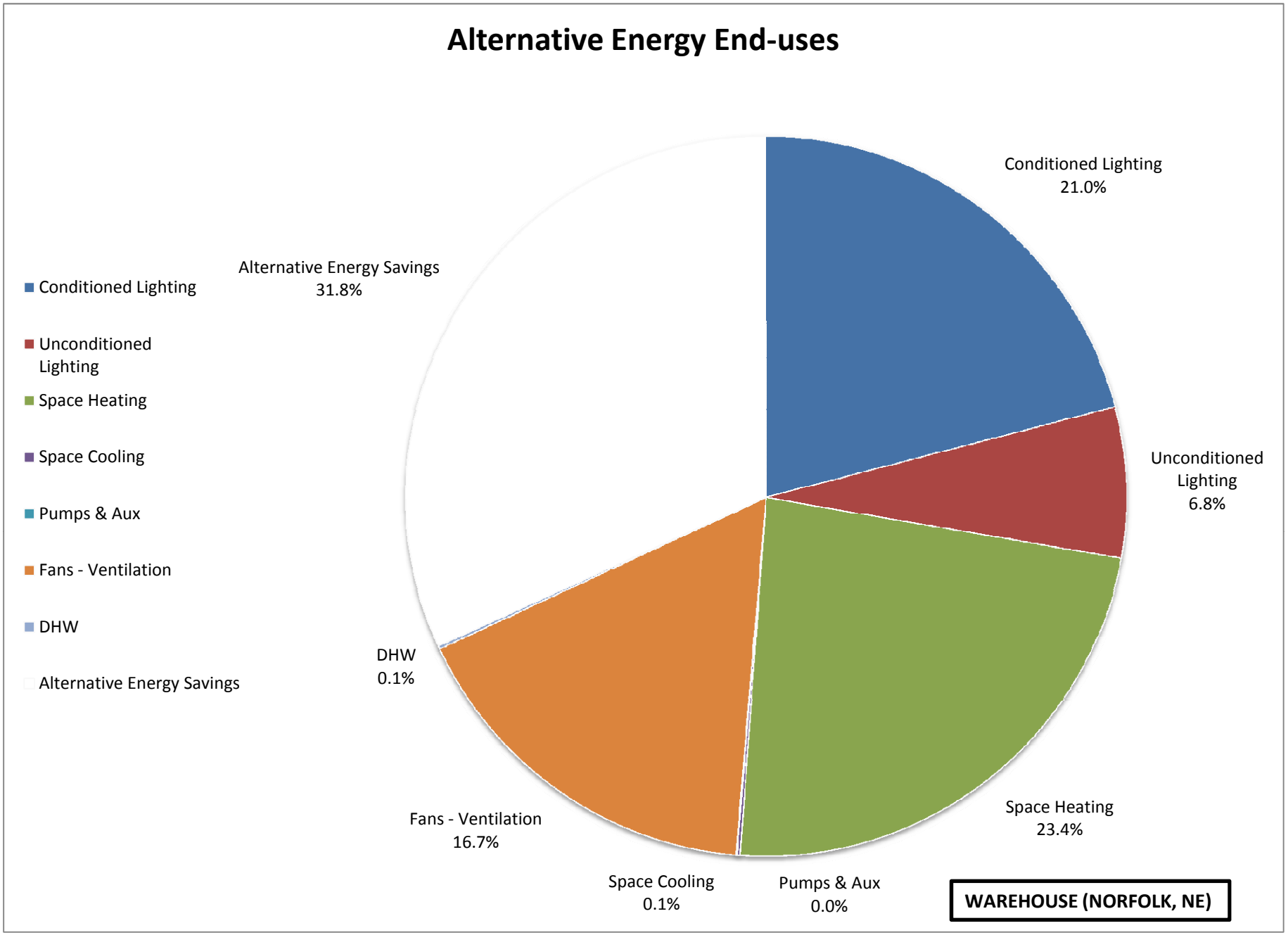
Building Energy Performance Summary - Base Case

End Use	*Energy Source*	*Baseline Building*		*Baseline Building +90*		*Baseline Building +180*		*Baseline Building +270*		Baseline Average		*% End Use of Baseline*
		Energy [MMbtu]	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	
Conditioned Lighting	Electricity	323.7	34.6	323.7	34.6	323.7	34.6	323.7	34.6	323.7	34.6	15.8%
Unconditioned Lighting	Electricity	104.5	1.4	104.5	1.4	104.5	1.4	104.5	1.4	104.5	1.4	5.1%
Misc Equipment	Electricity	503.9	53.9	503.9	53.9	503.9	53.9	503.9	53.9	503.9	53.9	24.6%
Space Heating	Electricity									0.0	0.0	0.0%
Space Heating	Gas	800.1	1.0	810.4	1.0	811.6	1.0	801.5	1.0	805.9	1.0	39.3%
Space Heating	Steam/ HW									0.0	0.0	0.0%
Space Cooling	Electricity	5.7	1.9	4.9	1.7	4.5	1.5	5.4	1.7	5.1	1.7	0.3%
Space Cooling	CHW									0.0	0.0	0.0%
Heat Rejection	Electricity									0.0	0.0	0.0%
Pumps & Aux	Electricity	0.7	0.0	0.7	0.0	0.7	0.0	0.7	0.0	0.7	0.0	0.0%
Fans - Ventilation	Electricity	303.8	25.5	302.0	25.4	300.6	25.3	302.4	25.4	302.2	25.4	14.8%
Fans - Exhaust	Electricity									0.0	0.0	0.0%
Refrigeration	Electricity									0.0	0.0	0.0%
HP Supplement	Electricity									0.0	0.0	0.0%
DHW	Elec									0.0	0.0	0.0%
DHW	Gas	2.2	0.0	2.2	0.0	2.2	0.0	2.2	0.0	2.2	0.0	0.1%
Total w/o Misc Equipment		1540.7		1548.4		1547.8		1540.4		1544.325		
Total w/ Misc Equipment		2044.6		2052.3		2051.7		2044.3		2048.225		

Energy Cost Summary

Energy Source	*Baseline Cost*	*Baseline Cost +90*	*Baseline Cost +180*	*Baseline Cost +270*	**Baseline Average**
Electricity*	$14,228	$14,176	$14,138	$14,193	**$14,184**
Gas	$6,829	$6,914	$6,924	$6,841	**$6,877**
Total	**$21,057**	**$21,090**	**$21,062**	**$21,034**	**$21,061**

*Electricity cost excludes Misc Equipment electrical consumption cost (based upon virtual rate)
DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms


Alternative Energy End-uses
Conditioned Lighting
Unconditioned Lighting
Space Heating
Space Cooling
Pumps & Aux
Fans - Ventilation
DHW
Alternative Energy Savings
Alternative Energy Savings
31.8%
Conditioned Lighting
21.0%
Unconditioned Lighting
6.8%
Space Heating
23.4%
Pumps & Aux
0.0%
Space Cooling
0.1%
Fans - Ventilation
16.7%
DHW
0.1%
WAREHOUSE (NORFOLK, NE)

Warehouse Energy Results Summary
Norfolk, NE

Description: Alternative

DX split system w/ gas furnace and gas fired radiant heat; 90% eff. furnace; CEE Tier 1; Improved wall; R-40 roof

Building Energy Performance Summary

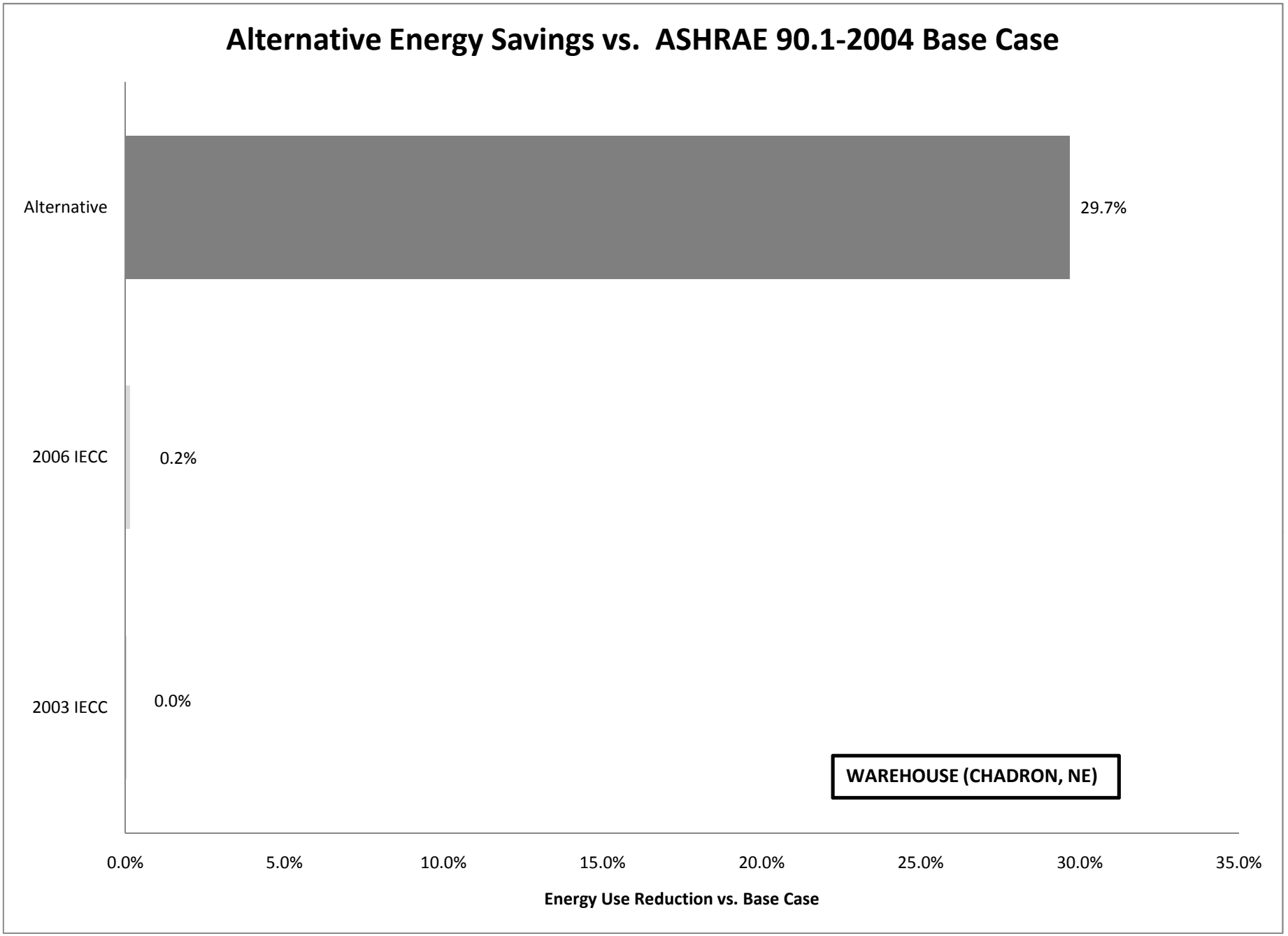
End Use	*Energy Source*	*Alternative Building*		*Average Baseline*		*Energy Difference Alt-Baseline*	*% of End Use of As Designed*	*Baseline Consumption Average*
		Energy [MMBtu]	*Peak [kW or therm/hr]*	*Energy [MMBtu]*	*Peak [kW or therm/hr]*	*[%]*	*[%]*	*[%]*
Conditioned Lighting	Electricity	323.7	18.2	323.7	34.6	0.0%	20.8%	15.8%
Unconditioned Lighting	Electricity	104.5	1.4	104.5	1.4	0.0%	6.7%	5.1%
Misc Equipment	Electricity	503.9	52.0	503.9	53.9	0.0%	32.4%	24.6%
Space Heating	Electricity			0.0	0.0		0.0%	0.0%
Space Heating	Gas	361.5	0.7	805.9	1.0	55.1%	23.2%	39.3%
Space Heating	Steam/ HW			0.0	0.0		0.0%	0.0%
Space Cooling	Elec	2.2	1.5	5.1	1.7	57.1%	0.1%	0.3%
Space Cooling	Chilled Water			0.0	0.0		0.0%	0.0%
Heat Rejection	Electricity			0.0	0.0		0.0%	0.0%
Pumps & Aux	Electricity	0.7	0.0	0.7	0.0	0.0%	0.0%	0.0%
Fans - Ventilation	Electricity	258.3	25.4	302.2	25.4	14.5%	16.6%	14.8%
Fans - Exhaust	Electricity			0.0	0.0		0.0%	0.0%
Refrigeration	Electricity			0.0	0.0		0.0%	0.0%
HP Supplement	Electricity			0.0	0.0		0.0%	0.0%
DHW	Elec			0.0	0.0		0.0%	0.0%
DHW	Gas	2.2	0.0	2.2	0.0	0.0%	0.1%	0.1%
Total w/o Misc Equipment		**1053.1**		**1544.3**		**31.8%**	100.0%	100.0%
Alternative Energy Savings		**491.2**						
Total w/ Misc Equipment		1557.0		2048.2				

Energy Cost Summary

Energy Source	*As Designed Cost*	*Baseline Cost*
Electricity*	$13,300	$14,184
Gas	$3,207	$6,877
Total	**$16,507**	**$21,061**

*Electricity cost excludes Misc Equipment electrical consumption cost (based upon virtual rate)

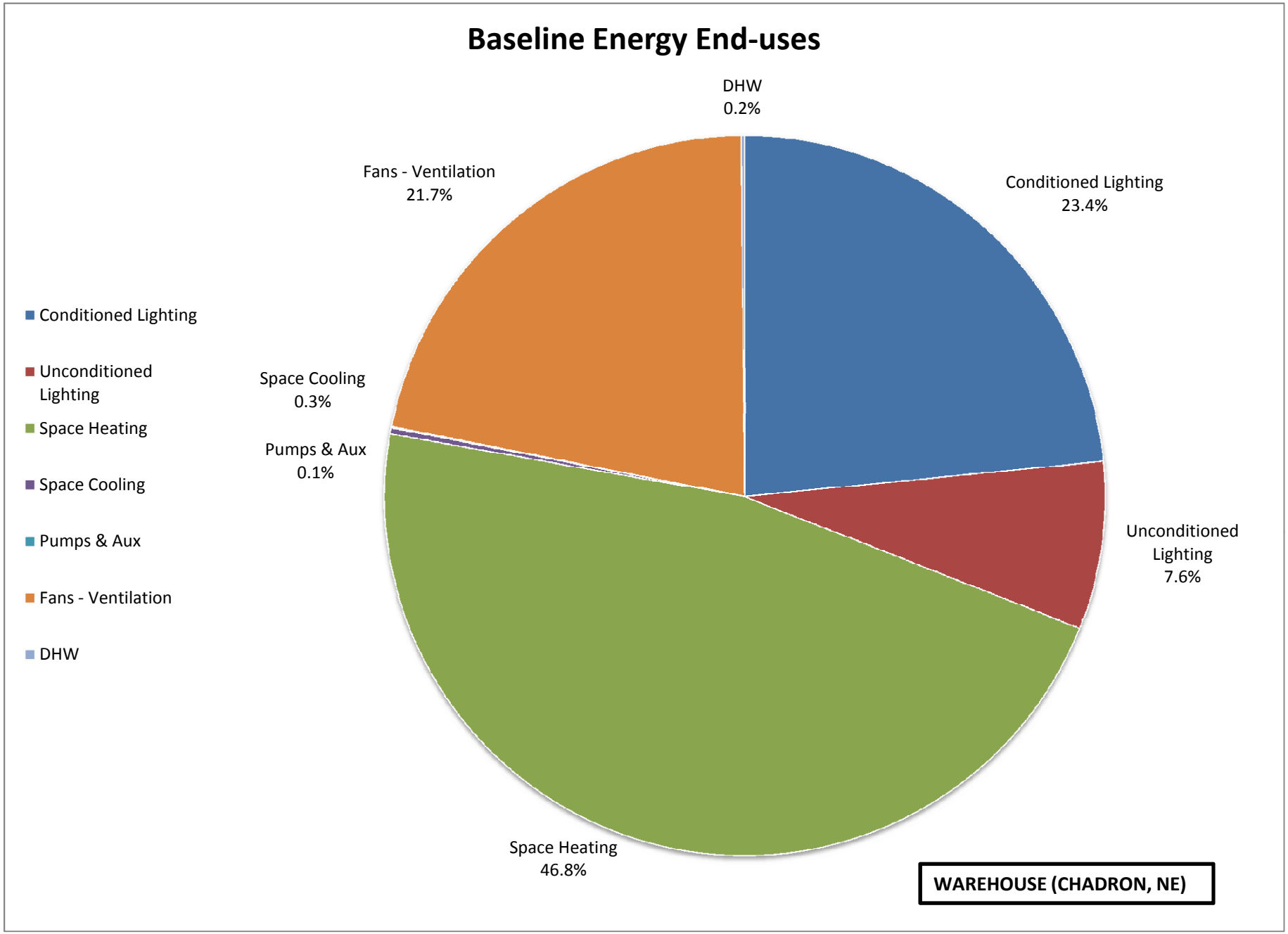
DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms


Alternative Energy Savings vs. ASHRAE 90.1-2004 Base Case
Alternative
29.7%
2006 IECC
0.2%
2003 IECC
0.0%
WAREHOUSE (CHADRON, NE)
0.0%
5.0%
10.0%
15.0%
20.0%
25.0%
30.0%
35.0%
Energy Use Reduction vs. Base Case

Warehouse Energy Results Summary
Chadron, NE

Run	Name	Annual Energy Use* [MMBtu]	Annual Energy Cost* [$]	Cost Savings vs. Avg. Base* [$]	Savings vs Avg. Base* [%]	Energy Use Reduction vs. Base* [MMBtu]	Energy Use Reduction vs. Base* [%]	Notes
0.00	Base Case	1378.3	$19,749					
	Base +90°	1386.1	$19,770					ASHRAE 90.1-2004 Baseline
	Base +180°	1386	$19,744					Appendix G
	Base +270°	1377.4	$19,709					Walls: U-0.084; Roof: U-0.063; Floors - U-0.052
	Avg Base Case	1381.95	$19,743					Windows: U-0.57, SHGC-0.39
1.10	2003 IECC	1381.5	$19,823	-$80	-0.4%	0.45	0.0%	2003 IECC
1.11	2006 IECC	1379.8	$19,759	-$16	-0.1%	2.15	0.2%	2006 IECC
3.42	As Designed	971.9	$15,739	$4,004	20.3%	410.05	29.7%	Alternative

*Reported excluding Misc Equipment electrical end-use


Baseline Energy End-uses
DHW
0.2%
Conditioned Lighting
23.4%
Fans - Ventilation
21.7%
Space Cooling
0.3%
Pumps & Aux
0.1%
Unconditioned
Lighting
7.6%
Space Heating
46.8%
Conditioned Lighting
Unconditioned
Lighting
Space Heating
Space Cooling
Pumps & Aux
Fans - Ventilation
DHW
WAREHOUSE (CHADRON, NE)

Warehouse Energy Results Summary
Chadron, NE

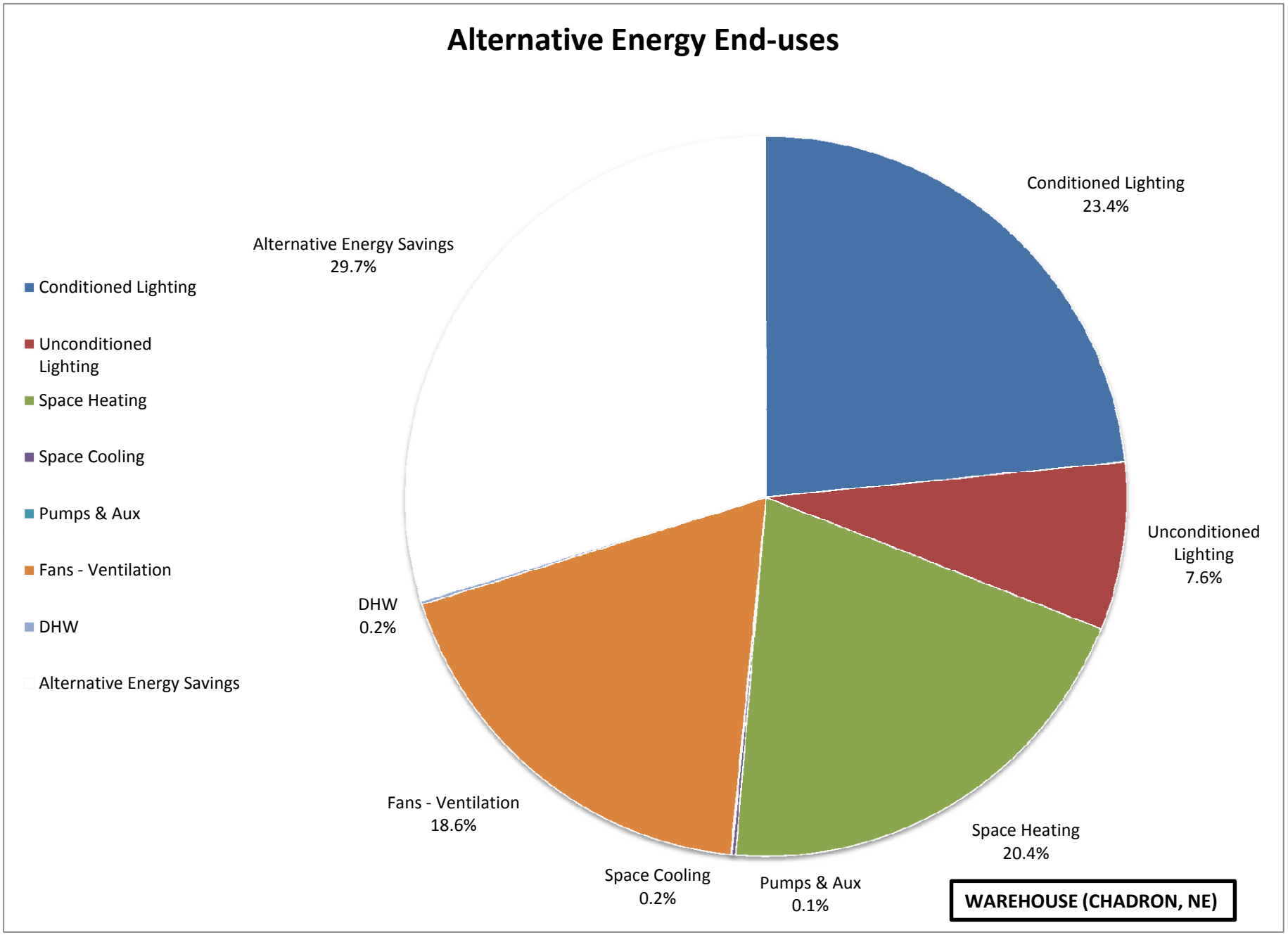
Building Energy Performance Summary - Base Case

End Use	*Energy Source*	*Baseline Building*		*Baseline Building +90*		*Baseline Building +180*		*Baseline Building +270*		Baseline Average		*% End Use of Baseline*
		Energy [MMbtu]	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	*Energy [MMbtu]*	*Peak [kW or therm/hr]*	
Conditioned Lighting	Electricity	323.7	34.6	323.7	34.6	323.7	34.6	323.7	34.6	323.7	34.6	17.2%
Unconditioned Lighting	Electricity	104.5	1.4	104.5	1.4	104.5	1.4	104.5	1.4	104.5	1.4	5.5%
Misc Equipment	Electricity	503.9	53.9	503.9	53.9	503.9	53.9	503.9	53.9	503.9	53.9	26.7%
Space Heating	Electricity									0.0	0.0	0.0%
Space Heating	Gas	640.1	0.9	651.6	0.9	653.6	0.9	642.0	0.9	646.8	0.9	34.3%
Space Heating	Steam/ HW									0.0	0.0	0.0%
Space Cooling	Electricity	4.5	1.7	3.4	0.0	3.1	0.0	4.0	1.8	3.8	0.9	0.2%
Space Cooling	CHW									0.0	0.0	0.0%
Heat Rejection	Electricity									0.0	0.0	0.0%
Pumps & Aux	Electricity	0.8	0.0	0.8	0.0	0.8	0.0	0.8	0.1	0.8	0.0	0.0%
Fans - Ventilation	Electricity	302.5	25.5	299.9	25.4	298.1	25.3	300.2	25.4	300.2	25.4	15.9%
Fans - Exhaust	Electricity									0.0	0.0	0.0%
Refrigeration	Electricity									0.0	0.0	0.0%
HP Supplement	Electricity									0.0	0.0	0.0%
DHW	Elec									0.0	0.0	0.0%
DHW	Gas	2.2	0.0	2.2	0.0	2.2	0.0	2.2	0.0	2.2	0.0	0.1%
Total w/o Misc Equipment		1378.3		1386.1		1386.0		1377.4		1381.95		
Total w/ Misc Equipment		1882.2		1890.0		1889.9		1881.3		1885.85		

Energy Cost Summary

Energy Source	*Baseline Cost*	*Baseline Cost +90*	*Baseline Cost +180*	*Baseline Cost +270*	**Baseline Average**
Electricity*	$14,186	$14,108	$14,065	$14,129	**$14,122**
Gas	$5,563	$5,662	$5,679	$5,580	**$5,621**
Total	**$19,749**	**$19,770**	**$19,744**	**$19,709**	**$19,743**

*Electricity cost excludes Misc Equipment electrical consumption cost (based upon virtual rate)
DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms


Alternative Energy End-uses
Conditioned Lighting
Unconditioned Lighting
Space Heating
Space Cooling
Pumps & Aux
Fans - Ventilation
DHW
Alternative Energy Savings
Alternative Energy Savings 29.7%
Conditioned Lighting 23.4%
Unconditioned Lighting 7.6%
Space Heating 20.4%
Pumps & Aux 0.1%
Space Cooling 0.2%
Fans - Ventilation 18.6%
DHW 0.2%
WAREHOUSE (CHADRON, NE)

Warehouse Energy Results Summary
Chadron, NE

Description: Alternative

DX split system w/ gas furnace and gas fired radiant heat; 90% eff. furnace; CEE Tier 1; Improved wall; R-40 roof

Building Energy Performance Summary

End Use	*Energy Source*	*Alternative Building*		*Average Baseline*		*Energy Difference Alt-Baseline*	*% of End Use of As Designed*	*Baseline Consumption Average*
		Energy [MMBtu]	*Peak [kW or therm/hr]*	*Energy [MMBtu]*	*Peak [kW or therm/hr]*	*[%]*	*[%]*	*[%]*
Conditioned Lighting	Electricity	323.7	18.2	323.7	34.6	0.0%	21.9%	17.2%
Unconditioned Lighting	Electricity	104.5	1.4	104.5	1.4	0.0%	7.1%	5.5%
Misc Equipment	Electricity	503.9	52.0	503.9	53.9	0.0%	34.1%	26.7%
Space Heating	Electricity			0.0	0.0		0.0%	0.0%
Space Heating	Gas	281.3	0.6	646.8	0.9	56.5%	19.1%	34.3%
Space Heating	Steam/ HW			0.0	0.0		0.0%	0.0%
Space Cooling	Elec	2.2	1.3	3.8	0.9	41.3%	0.1%	0.2%
Space Cooling	Chilled Water			0.0	0.0		0.0%	0.0%
Heat Rejection	Electricity			0.0	0.0		0.0%	0.0%
Pumps & Aux	Electricity	0.8	0.0	0.8	0.0	0.0%	0.1%	0.0%
Fans - Ventilation	Electricity	257.2	25.5	300.2	25.4	14.3%	17.4%	15.9%
Fans - Exhaust	Electricity			0.0	0.0		0.0%	0.0%
Refrigeration	Electricity			0.0	0.0		0.0%	0.0%
HP Supplement	Electricity			0.0	0.0		0.0%	0.0%
DHW	Elec			0.0	0.0		0.0%	0.0%
DHW	Gas	2.2	0.0	2.2	0.0	0.0%	0.1%	0.1%
Total w/o Misc Equipment		**971.9**		**1382.0**		**29.7%**	100.0%	100.0%
Alternative Energy Savings		**410.1**						
Total w/ Misc Equipment		1475.8		1885.9				

Energy Cost Summary

Energy Source	*As Designed Cost*	*Baseline Cost*
Electricity*	$13,284	$14,122
Gas	$2,455	$5,621
Total	**$15,739**	**$19,743**

*Electricity cost excludes Misc Equipment electrical consumption cost (based upon virtual rate)

DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms

BCC **Building Cost Consultants, Inc.** Professional Cost Estimators

P.O. Box 278 Plattsmouth, Nebraska 68048 Business (402) 298-8260 Fax (402) 298-8290 bccdsieh@cox.net

State of Nebraska
Nebraska Energy Office

Nebraska-specific Advanced Commercial Building Energy Code Study

Capital Cost Estimates

BCC Project # 09-08-0120

September 2, 2009

Nebraska-specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

SUMMARY SHEET

BUILDING TYPE	2003 IECC BASELINE BUILDING TOTAL	ALTERNATIVE (PROPOSED) BUILDING TOTAL	ADDED (DELTA) COST TOTAL
LARGE OFFICE - 18% WWR			
Large Office - Chadron Nebraska - 18% WWR	$579,428.00	$877,948.00	$298,520.00
Large Office - Norfolk, Nebraska - 18% WWR	$592,428.00	$916,448.00	$324,020.00
Large Office - Omaha, Nebraska - 18% WWR	$405,800.00	$674,828.00	$269,028.00
LARGE OFFICE - 38% WWR			
Large Office - Chadron, Nebraska - 38% WWR	$642,180.00	$934,548.00	$292,368.00
Large Office - Norfolk, Nebraska - 38% WWR	$642,680.00	$939,148.00	$296,468.00
Large Office - Omaha, Nebraska - 38% WWR	$617,020.00	$939,148.00	$322,128.00
SMALL OFFICE - 18% WWR			
Small Office - Chadron, Nebraska - 18% WWR	$172,216.00	$249,739.00	$77,523.00
Small Office - Norfolk, Nebraska - 18% WWR	$172,716.00	$249,739.00	$77,023.00
Small Office - Omaha, Nebraska - 18% WWR	$167,582.08	$249,739.00	$82,156.92
SMALL OFFICE - 38% WWR			
Small Office - Chadron, Nebraska - 38% WWR	$184,257.98	$270,758.00	$86,500.02
Small Office - Norfolk, Nebraska - 38% WWR	$183,257.98	$274,258.00	$91,000.02
Small Office - Omaha, Nebraska - 38% WWR	$177,882.08	$272,758.00	$94,875.92
SMALL RETAIL - 8% WWR			
Small Retail - Chadron, Nebraska - 8% WWR	$73,690.00	$99,780.00	$26,090.00
Small Retail - Norfolk, Nebraska - 8% WWR	$79,690.00	$105,780.00	$26,090.00
Small Retail - Omaha, Nebraska - 8% WWR	$79,190.00	$102,780.00	$23,590.00

Nebraska-specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

SUMMARY SHEET

BUILDING TYPE	2003 IECC BASELINE BUILDING TOTAL	ALTERNATIVE (PROPOSED) BUILDING TOTAL	ADDED (DELTA) COST TOTAL
ELEMENTARY - 18% WWR			
Elementary 18% WWR - Chadron, Nebraska	$502,930.00	$673,430.00	$170,500.00
Elementary 18% WWR - Norfolk, Nebraska	$527,630.00	$698,130.00	$170,500.00
Elementary 18% WWR - Omaha, Nebraska	$558,614.80	$741,030.00	$182,415.20
Retail Strip Mall			
Retail Strip Mall - Chadron, Nebraska	$197,325.00	$299,236.60	$101,911.60
Retail Strip Mall - Norfolk, Nebraska	$206,325.00	$313,636.60	$107,311.60
Retail Strip Mall - Omaha, Nebraska	$208,041.80	$320,836.60	$112,794.80
Large Big Box Retail			
Large Box Retail - Chadron, Nebraska - 2% WWR	$1,184,420.00	$803,420.00	-$381,000.00
Large Box Retail - Norfolk, Nebraska - 2% WWR	$1,073,520.00	$857,420.00	-$216,100.00
Large Box Retail - Omaha, Nebraska - 2% WWR	$1,026,390.00	$834,420.00	-$191,970.00
Warehouse			
Warehouse - Chadron, Nebraska	$214,280.00	$397,980.00	$183,700.00
Warehouse - Norfolk, Nebraska	$214,280.00	$397,980.00	$183,700.00
Warehouse - Omaha, Nebraska	$200,340.80	$397,980.00	$197,639.20
Secondary School - 18% WWR			
Secondary School - Chadron, Nebraska - 18% WWR	$1,035,804.50	$1,084,788.00	$48,983.50
Secondary School - Norfolk, Nebraska - 18% WWR	$1,059,304.50	$1,050,988.00	-$8,316.50
Secondary School - Omaha, Nebraska - 18% WWR	$1,115,913.54	$1,135,488.00	$19,574.46

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Secondary School - Chadron, Nebraska - 18% WWR**

Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
General:											
Exterior Wall System	R13 fiberglass batt insulation in 4-inch mtl. studs plus R3.8 continuous rigid insulation.	21,467	S.F.	$3.50	$75,134.50	R13 fiberglass batt insulation in 4-inch mtl. Studs plus R7.5 continuous rigid insulation.	21,467	S.F.	$4.00	$85,868.00	$10,733.50
Exterior Roof System	R20 (above deck) polyisocyanurate insulation.	80,000	S.F.	$2.29	$183,200.00	R20 (above deck) polyisocyanurate insulation.	80,000	S.F.	$2.29	$183,200.00	$0.00
Exterior Windows	Interior clear glass; No thermal frames.	3,870	S.F.	$41.00	$158,670.00	PPG-Solarban (70XL (2) Starphire) insulated glass w/ thermally-broken aluminum frames.	3,870	S.F.	$56.00	$216,720.00	$58,050.00
H.V.A.C.											
System 1	Packaged Rooftop V.A.V. with electric reheat - 101 tons.	1	EA.	$169,000.00	$169,000.00	Packaged single zone rooftop unit - 6 tons.	1	EA.	$7,800.00	$7,800.00	($161,200.00)
	V.A.V. Parallel Fan Powered Boxes - 2,362 CFM.	1	EA.	$2,800.00	$2,800.00						
	V.A.V. Parallel Fan Powered Boxes - 1,282 CFM.	1	EA.	$1,800.00	$1,800.00						

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Secondary School - Chadron, Nebraska - 18% WWR**

Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
	V.A.V. Parallel Fan Powered Boxes - 3,528 CFM.	1	EA.	$4,000.00	$4,000.00						
	V.A.V. Parallel Fan Powered Boxes - 2,257 CFM.	1	EA.	$2,800.00	$2,800.00						
	V.A.V. Parallel Fan Powered Boxes - 2,256 CFM.	1	EA.	$2,800.00	$2,800.00						
	V.A.V. Parallel Fan Powered Boxes - 2,232 CFM.	1	EA.	$2,700.00	$2,700.00						
	V.A.V. Parallel Fan Powered Boxes - 1,465 CFM.	1	EA.	$2,000.00	$2,000.00						
	V.A.V. Parallel Fan Powered Boxes - 1,526 CFM.	1	EA.	$2,000.00	$2,000.00						
	V.A.V. Parallel Fan Powered Boxes - 2,296 CFM.	1	EA.	$2,800.00	$2,800.00						
	V.A.V. Parallel Fan Powered Boxes - 4,899 CFM.	1	EA.	$5,400.00	$5,400.00						
	V.A.V. Parallel Fan Powered Boxes - 4,468 CFM.	1	EA.	$5,000.00	$5,000.00						

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Secondary School - Chadron, Nebraska - 18% WWR**

Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
	V.A.V. Parallel Fan Powered Boxes - 3,526 CFM.	1	EA.	$4,000.00	$4,000.00						
	V.A.V. Parallel Fan Powered Boxes - 3,557 CFM.	1	EA.	$4,100.00	$4,100.00						
System 2	Packaged Rooftop V.A.V. with HW reheat - 63 tons.	1	EA.	$123,000.00	$123,000.00	Packaged single zone rooftop unit - 4 tons.	1	EA.	$5,200.00	$5,200.00	($117,800.00)
	V.A.V. Parallel Fan Powered Boxes - 3,178 CFM.	1	EA.	$3,700.00	$3,700.00						
	V.A.V. Parallel Fan Powered Boxes - 2,200 CFM.	3	EA.	$3,200.00	$9,600.00						
	V.A.V. Parallel Fan Powered Boxes - 2,800 CFM.	5	EA.	$3,300.00	$16,500.00						
System 3	Packaged Rooftop V.A.V. with HW reheat - 92 tons.	1	EA.	$162,000.00	$162,000.00	Packaged single zone rooftop unit - 9 tons.	1	EA.	$11,700.00	$11,700.00	($150,300.00)
	V.A.V. Parallel Fan Powered Boxes - 3,764 CFM.	1	EA.	$4,200.00	$4,200.00						
	V.A.V. Parallel Fan Powered Boxes - 3,495 CFM.	1	EA.	$4,000.00	$4,000.00						

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Secondary School - Chadron, Nebraska - 18% WWR**

Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
	V.A.V. Parallel Fan Powered Boxes - 1,544 CFM.	1	EA.	$2,000.00	$2,000.00						
	V.A.V. Parallel Fan Powered Boxes - 2,002 CFM.	1	EA.	$2,500.00	$2,500.00						
	V.A.V. Parallel Fan Powered Boxes - 1,388 CFM.	1	EA.	$1,900.00	$1,900.00						
	V.A.V. Parallel Fan Powered Boxes - 1,922 CFM.	1	EA.	$2,400.00	$2,400.00						
	V.A.V. Parallel Fan Powered Boxes - 2,100 CFM.	2	EA.	$2,600.00	$5,200.00						
	V.A.V. Parallel Fan Powered Boxes - 1,292 CFM.	1	EA.	$1,800.00	$1,800.00						
	V.A.V. Parallel Fan Powered Boxes - 3,981 CFM.	1	EA.	$4,400.00	$4,400.00						
	V.A.V. Parallel Fan Powered Boxes - 3,979 CFM.	1	EA.	$4,400.00	$4,400.00						
	V.A.V. Parallel Fan Powered Boxes - 2,000 CFM.	2	EA.	$2,500.00	$5,000.00						

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Secondary School - Chadron, Nebraska - 18% WWR**

Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
	V.A.V. Parallel Fan Powered Boxes - 1,526 CFM.	1	EA.	$2,000.00	$2,000.00						
System 4						Packaged single zone rooftop unit - 6 tons.	1	EA.	$7,800.00	$7,800.00	$7,800.00
System 5						Packaged single zone rooftop unit - 6 tons.	1	EA.	$7,800.00	$7,800.00	$7,800.00
System 6						Packaged single zone rooftop unit - 4 tons.	1	EA.	$5,200.00	$5,200.00	$5,200.00
System 7						Packaged single zone rooftop unit - 4 tons.	1	EA.	$5,200.00	$5,200.00	$5,200.00
System 8						Packaged single zone rooftop unit - 9 tons.	1	EA.	$11,700.00	$11,700.00	$11,700.00
System 9						Packaged single zone rooftop unit - 6 tons.	1	EA.	$7,800.00	$7,800.00	$7,800.00
System 10						Packaged single zone rooftop unit - 8 tons.	1	EA.	$10,400.00	$10,400.00	$10,400.00
System 11						Packaged single zone rooftop unit - 14 tons.	1	EA.	$18,200.00	$18,200.00	$18,200.00

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Secondary School - Chadron, Nebraska - 18% WWR**

Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
System 12						Packaged single zone rooftop unit - 11 tons.	1	EA.	$14,300.00	$14,300.00	$14,300.00
System 13						Packaged single zone rooftop unit - 10 tons.	1	EA.	$13,000.00	$13,000.00	$13,000.00
System 14						Packaged single zone rooftop unit - 8 tons.	1	EA.	$10,400.00	$10,400.00	$10,400.00
System 15						Packaged single zone rooftop unit - 4 tons.	1	EA.	$5,200.00	$5,200.00	$5,200.00
System 16						Packaged single zone rooftop unit - 9 tons.	1	EA.	$11,700.00	$11,700.00	$11,700.00
System 17						Packaged single zone rooftop unit - 9 tons.	1	EA.	$11,700.00	$11,700.00	$11,700.00
System 18						Packaged single zone rooftop unit - 5 tons.	1	EA.	$6,500.00	$6,500.00	$6,500.00
System 19						Packaged single zone rooftop unit - 4 tons.	1	EA.	$5,200.00	$5,200.00	$5,200.00
System 20						Packaged single zone rooftop unit - 5 tons.	1	EA.	$6,500.00	$6,500.00	$6,500.00

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Secondary School - Chadron, Nebraska - 18% WWR**

Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
System 21						Packaged single zone rooftop unit - 11 tons.	1	EA.	$14,300.00	$14,300.00	$14,300.00
System 22						Packaged single zone rooftop unit - 2 tons.	1	EA.	$2,600.00	$2,600.00	$2,600.00
System 23						Packaged single zone rooftop unit - 10 tons.	1	EA.	$13,000.00	$13,000.00	$13,000.00
System 24						Packaged single zone rooftop unit - 10 tons.	1	EA.	$13,000.00	$13,000.00	$13,000.00
System 25						Packaged single zone rooftop unit - 10 tons.	1	EA.	$13,000.00	$13,000.00	$13,000.00
System 26						Packaged single zone rooftop unit - 14 tons.	1	EA.	$18,200.00	$18,200.00	$18,200.00
System 27						Packaged single zone rooftop unit - 35 tons.	1	EA.	$45,500.00	$45,500.00	$45,500.00
System 28						Packaged single zone rooftop unit - 6 tons.	1	EA.	$7,800.00	$7,800.00	$7,800.00
						Heat Recovery Units:					
						780 CFM.	1	EA.	$7,000.00	$7,000.00	$7,000.00

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Secondary School - Chadron, Nebraska - 18% WWR**

Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
						460 CFM.	4	EA.	$3,200.00	$12,800.00	$12,800.00
						1,320 CFM.	4	EA.	$11,000.00	$44,000.00	$44,000.00
						750 CFM.	2	EA.	$7,000.00	$14,000.00	$14,000.00
						1,350 CFM.	2	EA.	$11,200.00	$22,400.00	$22,400.00
						1,800 CFM.	1	EA.	$13,300.00	$13,300.00	$13,300.00
						2,060 CFM.	1	EA.	$15,500.00	$15,500.00	$15,500.00
						2,400 CFM.	1	EA.	$19,200.00	$19,200.00	$19,200.00
						1,190 CFM.	1	EA.	$9,300.00	$9,300.00	$9,300.00
						280 CFM.	1	EA.	$2,400.00	$2,400.00	$2,400.00
						1,600 CFM.	1	EA.	$12,700.00	$12,700.00	$12,700.00
						690 CFM.	1	EA.	$4,900.00	$4,900.00	$4,900.00
						3,680 CFM.	1	EA.	$22,500.00	$22,500.00	$22,500.00
						1,330 CFM.	2	EA.	$11,000.00	$22,000.00	$22,000.00
						1,060 CFM.	1	EA.	$8,500.00	$8,500.00	$8,500.00
						640 CFM.	1	EA.	$4,800.00	$4,800.00	$4,800.00
Lighting:	ASHRAE 90.1 Space Dependant - T-8 lamps.	530	EA.	$100.00	$53,000.00	ASHRAE 90.1 Space Dependant - T-8 lamps.	530	EA.	$100.00	$53,000.00	$0.00
TOTALS =					**$1,035,804.50**					**$1,084,788.00**	**$48,983.50**

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Secondary School - Norfolk, Nebraska - 18% WWR** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
General:											
Exterior Wall System	R13 fiberglass batt insulation in 4-inch mtl. studs plus R3.8 continuous rigid insulation.	21,467	S.F.	$3.50	$75,134.50	R13 fiberglass batt insulation in 4-inch mtl. Studs plus R7.5 continuous rigid insulation.	21,467	S.F.	$4.00	$85,868.00	$10,733.50
Exterior Roof System	R20 (above deck) polyisocyanurate insulation.	80,000	S.F.	$2.29	$183,200.00	R20 (above deck) polyisocyanurate insulation.	80,000	S.F.	$2.29	$183,200.00	$0.00
Exterior Windows	Interior clear glass; No thermal frames.	3,870	S.F.	$41.00	$158,670.00	PPG-Solarban (70XL (2) Starphire) insulated glass w/ thermally-broken aluminum frames.	3,870	S.F.	$56.00	$216,720.00	$58,050.00
H.V.A.C.											
System 1	Packaged Rooftop V.A.V. with electric reheat - 89 tons.	1	EA.	$185,000.00	$185,000.00	Packaged single zone rooftop unit - 5 tons.	1	EA.	$6,500.00	$6,500.00	($178,500.00)
	V.A.V. Parallel Fan Powered Boxes - 2,201 CFM.	1	EA.	$2,700.00	$2,700.00						
	V.A.V. Parallel Fan Powered Boxes - 1,183 CFM.	1	EA.	$1,700.00	$1,700.00						

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Secondary School - Norfolk, Nebraska - 18% WWR** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
	V.A.V. Parallel Fan Powered Boxes - 3,303 CFM.	1	EA.	$3,800.00	$3,800.00						
	V.A.V. Parallel Fan Powered Boxes - 2,086 CFM.	1	EA.	$2,600.00	$2,600.00						
	V.A.V. Parallel Fan Powered Boxes - 2,085 CFM.	1	EA.	$2,600.00	$2,600.00						
	V.A.V. Parallel Fan Powered Boxes - 2,052 CFM.	1	EA.	$2,600.00	$2,600.00						
	V.A.V. Parallel Fan Powered Boxes - 1,311 CFM.	1	EA.	$1,800.00	$1,800.00						
	V.A.V. Parallel Fan Powered Boxes - 1,431 CFM.	1	EA.	$1,900.00	$1,900.00						
	V.A.V. Parallel Fan Powered Boxes - 2,159 CFM.	1	EA.	$2,700.00	$2,700.00						
	V.A.V. Parallel Fan Powered Boxes - 2,300 CFM.	2	EA.	$2,800.00	$5,600.00						

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Secondary School - Norfolk, Nebraska - 18% WWR** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
	V.A.V. Parallel Fan Powered Boxes - 2,100 CFM.	2	EA.	$2,700.00	$5,400.00						
	V.A.V. Parallel Fan Powered Boxes - 3,302 CFM.	1	EA.	$3,800.00	$3,800.00						
	V.A.V. Parallel Fan Powered Boxes - 3,331 CFM.	1	EA.	$3,800.00	$3,800.00						
System 2	Packaged Rooftop V.A.V. with HW reheat - 60 tons.	1	EA.	$130,000.00	$130,000.00	Packaged single zone rooftop unit - 3 tons.	1	EA.	$3,900.00	$3,900.00	($126,100.00)
	V.A.V. Parallel Fan Powered Boxes - 2,978 CFM.	1	EA.	$3,500.00	$3,500.00						
	V.A.V. Parallel Fan Powered Boxes - 3,800 CFM.	2	EA.	$4,300.00	$8,600.00						
	V.A.V. Parallel Fan Powered Boxes - 2,600 CFM.	5	EA.	$3,100.00	$15,500.00						
System 3	Packaged Rooftop V.A.V. with HW reheat - 81 tons.	1	EA.	$167,000.00	$167,000.00	Packaged single zone rooftop unit - 8 tons.	1	EA.	$10,400.00	$10,400.00	($156,600.00)

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Secondary School - Norfolk, Nebraska - 18% WWR** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
	V.A.V. Parallel Fan Powered Boxes - 3,539 CFM.	1	EA.	$4,000.00	$4,000.00						
	V.A.V. Parallel Fan Powered Boxes - 3,176 CFM.	1	EA.	$3,700.00	$3,700.00						
	V.A.V. Parallel Fan Powered Boxes - 1,419 CFM.	1	EA.	$1,900.00	$1,900.00						
	V.A.V. Parallel Fan Powered Boxes - 1,885 CFM.	1	EA.	$2,400.00	$2,400.00						
	V.A.V. Parallel Fan Powered Boxes - 1,304 CFM.	1	EA.	$1,800.00	$1,800.00						
	V.A.V. Parallel Fan Powered Boxes - 1,803 CFM.	1	EA.	$2,300.00	$2,300.00						
	V.A.V. Parallel Fan Powered Boxes - 2,000 CFM.	2	EA.	$2,500.00	$5,000.00						
	V.A.V. Parallel Fan Powered Boxes - 1,212 CFM.	1	EA.	$1,700.00	$1,700.00						

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Secondary School - Norfolk, Nebraska - 18% WWR** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
	V.A.V. Parallel Fan Powered Boxes - 3,648 CFM.	1	EA.	$4,200.00	$4,200.00						
	V.A.V. Parallel Fan Powered Boxes - 3,647 CFM.	1	EA.	$4,200.00	$4,200.00						
	V.A.V. Parallel Fan Powered Boxes - 2,300 CFM.	2	EA.	$2,800.00	$5,600.00						
	V.A.V. Parallel Fan Powered Boxes - 1,431 CFM.	1	EA.	$1,900.00	$1,900.00						
System 4						Packaged single zone rooftop unit - 5 tons.	1	EA.	$6,500.00	$6,500.00	$6,500.00
System 5						Packaged single zone rooftop unit - 5 tons.	1	EA.	$6,500.00	$6,500.00	$6,500.00
System 6						Packaged single zone rooftop unit - 4 tons.	1	EA.	$5,200.00	$5,200.00	$5,200.00
System 7						Packaged single zone rooftop unit - 3 tons.	1	EA.	$3,900.00	$3,900.00	$3,900.00

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Secondary School - Norfolk, Nebraska - 18% WWR** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
System 8						Packaged single zone rooftop unit - 8 tons.	1	EA.	$10,400.00	$10,400.00	$10,400.00
System 9						Packaged single zone rooftop unit - 5 tons.	1	EA.	$6,500.00	$6,500.00	$6,500.00
System 10						Packaged single zone rooftop unit - 7 tons.	1	EA.	$9,100.00	$9,100.00	$9,100.00
System 11						Packaged single zone rooftop unit - 12 tons.	1	EA.	$15,600.00	$15,600.00	$15,600.00
System 12						Packaged single zone rooftop unit - 10 tons.	1	EA.	$13,000.00	$13,000.00	$13,000.00
System 13						Packaged single zone rooftop unit - 9 tons.	1	EA.	$11,700.00	$11,700.00	$11,700.00
System 14						Packaged single zone rooftop unit - 6 tons.	1	EA.	$7,800.00	$7,800.00	$7,800.00
System 15						Packaged single zone rooftop unit - 4 tons.	1	EA.	$5,200.00	$5,200.00	$5,200.00

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Secondary School - Norfolk, Nebraska - 18% WWR** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
System 16						Packaged single zone rooftop unit - 8 tons.	1	EA.	$10,400.00	$10,400.00	$10,400.00
System 17						Packaged single zone rooftop unit - 8 tons.	1	EA.	$10,400.00	$10,400.00	$10,400.00
System 18						Packaged single zone rooftop unit - 5 tons.	1	EA.	$6,500.00	$6,500.00	$6,500.00
System 19						Packaged single zone rooftop unit - 3 tons.	1	EA.	$3,900.00	$3,900.00	$3,900.00
System 20						Packaged single zone rooftop unit - 5 tons.	1	EA.	$6,500.00	$6,500.00	$6,500.00
System 21						Packaged single zone rooftop unit - 10 tons.	1	EA.	$13,000.00	$13,000.00	$13,000.00
System 22						Packaged single zone rooftop unit - 2 tons.	1	EA.	$2,600.00	$2,600.00	$2,600.00
System 23						Packaged single zone rooftop unit - 10 tons.	1	EA.	$13,000.00	$13,000.00	$13,000.00

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Secondary School - Norfolk, Nebraska - 18% WWR** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
System 24						Packaged single zone rooftop unit - 9 tons.	1	EA.	$11,700.00	$11,700.00	$11,700.00
System 25						Packaged single zone rooftop unit - 9 tons.	1	EA.	$11,700.00	$11,700.00	$11,700.00
System 26						Packaged single zone rooftop unit - 13 tons.	1	EA.	$16,900.00	$16,900.00	$16,900.00
System 27						Packaged single zone rooftop unit - 32 tons.	1	EA.	$41,600.00	$41,600.00	$41,600.00
System 28						Packaged single zone rooftop unit - 5 tons.	1	EA.	$6,500.00	$6,500.00	$6,500.00
						Heat Recovery Units:					
						780 CFM.	1	EA.	$7,000.00	$7,000.00	$7,000.00
						460 CFM.	4	EA.	$3,200.00	$12,800.00	$12,800.00
						1,320 CFM.	4	EA.	$11,000.00	$44,000.00	$44,000.00
						750 CFM.	2	EA.	$7,000.00	$14,000.00	$14,000.00
						1,350 CFM.	2	EA.	$11,200.00	$22,400.00	$22,400.00
						1,800 CFM.	1	EA.	$13,300.00	$13,300.00	$13,300.00
						2,060 CFM.	1	EA.	$15,500.00	$15,500.00	$15,500.00
						2,400 CFM.	1	EA.	$19,200.00	$19,200.00	$19,200.00
						1,190 CFM.	1	EA.	$9,300.00	$9,300.00	$9,300.00
						280 CFM.	1	EA.	$2,400.00	$2,400.00	$2,400.00
						1,600 CFM.	1	EA.	$12,700.00	$12,700.00	$12,700.00

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Secondary School - Norfolk, Nebraska - 18% WWR** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
						690 CFM.	1	EA.	$4,900.00	$4,900.00	$4,900.00
						3,680 CFM.	1	EA.	$22,500.00	$22,500.00	$22,500.00
						1,330 CFM.	2	EA.	$11,000.00	$22,000.00	$22,000.00
						1,060 CFM.	1	EA.	$8,500.00	$8,500.00	$8,500.00
						640 CFM.	1	EA.	$4,800.00	$4,800.00	$4,800.00
Lighting:	ASHRAE 90.1 Space Dependant - T-8 lamps.	530	EA.	$100.00	$53,000.00	ASHRAE 90.1 Space Dependant - T-8 lamps.	530	EA.	$100.00	$53,000.00	$0.00
TOTALS =					**$1,059,304.50**					**$1,050,988.00**	**($8,316.50)**

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Secondary School - Omaha, Nebraska - 18% WWR** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
General:											
Exterior Wall System	R13 fiberglass batt insulation in 4-inch mtl. studs without continuous rigid insulation.	21,467	S.F.	$2.62	$56,243.54	R13 fiberglass batt insulation in 4-inch mtl. Studs plus R7.5 continuous rigid insulation.	21,467	S.F.	$4.00	$85,868.00	$29,624.46
Exterior Roof System	R20 (above deck) polyisocyanurate insulation.	80,000	S.F.	$2.29	$183,200.00	R20 (above deck) polyisocyanurate insulation.	80,000	S.F.	$2.29	$183,200.00	$0.00
Exterior Windows	Interior clear glass; No thermal frames.	3,870	S.F.	$41.00	$158,670.00	PPG-Solarban (70XL (2) Starphire) insulated glass w/ thermally-broken aluminum frames.	3,870	S.F.	$56.00	$216,720.00	$58,050.00
H.V.A.C.											
System 1	Packaged Rooftop V.A.V. with electric reheat - 120 tons.	1	EA.	$198,000.00	$198,000.00	Packaged single zone rooftop unit - 7 tons.	1	EA.	$9,100.00	$9,100.00	($188,900.00)
	V.A.V. Parallel Fan Powered Boxes - 2,272 CFM.	1	EA.	$2,800.00	$2,800.00						
	V.A.V. Parallel Fan Powered Boxes - 1,200 CFM.	1	EA.	$1,700.00	$1,700.00						

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Secondary School - Omaha, Nebraska - 18% WWR** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
	V.A.V. Parallel Fan Powered Boxes - 3,302 CFM.	1	EA.	$3,800.00	$3,800.00						
	V.A.V. Parallel Fan Powered Boxes - 2,106 CFM.	1	EA.	$2,600.00	$2,600.00						
	V.A.V. Parallel Fan Powered Boxes - 2,105 CFM.	1	EA.	$2,600.00	$2,600.00						
	V.A.V. Parallel Fan Powered Boxes - 2,076 CFM.	1	EA.	$2,500.00	$2,500.00						
	V.A.V. Parallel Fan Powered Boxes - 1,319 CFM.	1	EA.	$1,800.00	$1,800.00						
	V.A.V. Parallel Fan Powered Boxes - 1,404 CFM.	1	EA.	$1,900.00	$1,900.00						
	V.A.V. Parallel Fan Powered Boxes - 2,120 CFM.	1	EA.	$2,600.00	$2,600.00						
	V.A.V. Parallel Fan Powered Boxes - 2,300 CFM.	2	EA.	$2,800.00	$5,600.00						

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Secondary School - Omaha, Nebraska - 18% WWR** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
	V.A.V. Parallel Fan Powered Boxes - 2,000 CFM.	2	EA.	$2,500.00	$5,000.00						
	V.A.V. Parallel Fan Powered Boxes - 3,300 CFM.	1	EA.	$3,800.00	$3,800.00						
	V.A.V. Parallel Fan Powered Boxes - 3,329 CFM.	1	EA.	$3,800.00	$3,800.00						
System 2	Packaged Rooftop V.A.V. with HW reheat - 74 tons.	1	EA.	$158,000.00	$158,000.00	Packaged single zone rooftop unit - 4 tons.	1	EA.	$5,200.00	$5,200.00	($152,800.00)
	V.A.V. Parallel Fan Powered Boxes - 3,028 CFM.	1	EA.	$3,500.00	$3,500.00						
	V.A.V. Parallel Fan Powered Boxes - 3,700 CFM.	2	EA.	$4,200.00	$8,400.00						
	V.A.V. Parallel Fan Powered Boxes - 2,600 CFM.	5	EA.	$3,100.00	$15,500.00						
System 3	Packaged Rooftop V.A.V. with HW reheat - 108 tons.	1	EA.	$204,000.00	$204,000.00	Packaged single zone rooftop unit - 11 tons.	1	EA.	$14,300.00	$14,300.00	($189,700.00)

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Secondary School - Omaha, Nebraska - 18% WWR** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
	V.A.V. Parallel Fan Powered Boxes - 3,476 CFM.	1	EA.	$4,100.00	$4,100.00						
	V.A.V. Parallel Fan Powered Boxes - 3,136 CFM.	1	EA.	$3,700.00	$3,700.00						
	V.A.V. Parallel Fan Powered Boxes - 1,433 CFM.	1	EA.	$1,900.00	$1,900.00						
	V.A.V. Parallel Fan Powered Boxes - 1,907 CFM.	1	EA.	$2,400.00	$2,400.00						
	V.A.V. Parallel Fan Powered Boxes - 1,341 CFM.	1	EA.	$1,900.00	$1,900.00						
	V.A.V. Parallel Fan Powered Boxes - 1,790 CFM.	1	EA.	$2,300.00	$2,300.00						
	V.A.V. Parallel Fan Powered Boxes - 3,880 CFM.	1	EA.	$4,400.00	$4,400.00						
	V.A.V. Parallel Fan Powered Boxes - 1,202 CFM.	1	EA.	$1,700.00	$1,700.00						

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Secondary School - Omaha, Nebraska - 18% WWR** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
	V.A.V. Parallel Fan Powered Boxes - 3,713 CFM.	1	EA.	$4,200.00	$4,200.00						
	V.A.V. Parallel Fan Powered Boxes - 3,711 CFM.	1	EA.	$4,200.00	$4,200.00						
	V.A.V. Parallel Fan Powered Boxes - 3,743 CFM.	1	EA.	$4,200.00	$4,200.00						
	V.A.V. Parallel Fan Powered Boxes - 1,404 CFM.	1	EA.	$1,900.00	$1,900.00						
System 4						Packaged single zone rooftop unit - 7 tons.	1	EA.	$9,100.00	$9,100.00	$9,100.00
System 5						Packaged single zone rooftop unit - 7 tons.	1	EA.	$9,100.00	$9,100.00	$9,100.00
System 6						Packaged single zone rooftop unit - 4 tons.	1	EA.	$5,200.00	$5,200.00	$5,200.00
System 7						Packaged single zone rooftop unit - 4 tons.	1	EA.	$5,200.00	$5,200.00	$5,200.00

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Secondary School - Omaha, Nebraska - 18% WWR** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
System 8						Packaged single zone rooftop unit - 10 tons.	1	EA.	$13,000.00	$13,000.00	$13,000.00
System 9						Packaged single zone rooftop unit - 8 tons.	1	EA.	$10,400.00	$10,400.00	$10,400.00
System 10						Packaged single zone rooftop unit - 10 tons.	1	EA.	$13,000.00	$13,000.00	$13,000.00
System 11						Packaged single zone rooftop unit - 16 tons.	1	EA.	$20,800.00	$20,800.00	$20,800.00
System 12						Packaged single zone rooftop unit - 14 tons.	1	EA.	$18,200.00	$18,200.00	$18,200.00
System 13						Packaged single zone rooftop unit - 12 tons.	1	EA.	$15,600.00	$15,600.00	$15,600.00
System 14						Packaged single zone rooftop unit - 7 tons.	1	EA.	$9,100.00	$9,100.00	$9,100.00
System 15						Packaged single zone rooftop unit - 4 tons.	1	EA.	$5,200.00	$5,200.00	$5,200.00

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Secondary School - Omaha, Nebraska - 18% WWR**

Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
System 16						Packaged single zone rooftop unit - 11 tons.	1	EA.	$14,300.00	$14,300.00	$14,300.00
System 17						Packaged single zone rooftop unit - 11 tons.	1	EA.	$14,300.00	$14,300.00	$14,300.00
System 18						Packaged single zone rooftop unit - 6 tons.	1	EA.	$7,800.00	$7,800.00	$7,800.00
System 19						Packaged single zone rooftop unit - 4 tons.	1	EA.	$5,200.00	$5,200.00	$5,200.00
System 20						Packaged single zone rooftop unit - 6 tons.	1	EA.	$7,800.00	$7,800.00	$7,800.00
System 21						Packaged single zone rooftop unit - 13 tons.	1	EA.	$16,900.00	$16,900.00	$16,900.00
System 22						Packaged single zone rooftop unit - 2 tons.	1	EA.	$2,600.00	$2,600.00	$2,600.00
System 23						Packaged single zone rooftop unit - 12 tons.	1	EA.	$15,600.00	$15,600.00	$15,600.00

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Secondary School - Omaha, Nebraska - 18% WWR** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
System 24						Packaged single zone rooftop unit - 12 tons.	1	EA.	$15,600.00	$15,600.00	$15,600.00
System 25						Packaged single zone rooftop unit - 12 tons.	1	EA.	$15,600.00	$15,600.00	$15,600.00
System 26						Packaged single zone rooftop unit - 16 tons.	1	EA.	$20,800.00	$20,800.00	$20,800.00
System 27						Packaged single zone rooftop unit - 40 tons.	1	EA.	$52,000.00	$52,000.00	$52,000.00
System 28						Packaged single zone rooftop unit - 8 tons.	1	EA.	$10,400.00	$10,400.00	$10,400.00
						Heat Recovery Units:					
						780 CFM.	1	EA.	$7,000.00	$7,000.00	$7,000.00
						460 CFM.	4	EA.	$3,200.00	$12,800.00	$12,800.00
						1,320 CFM.	4	EA.	$11,000.00	$44,000.00	$44,000.00
						750 CFM.	2	EA.	$7,000.00	$14,000.00	$14,000.00
						1,350 CFM.	2	EA.	$11,200.00	$22,400.00	$22,400.00
						1,800 CFM.	1	EA.	$13,300.00	$13,300.00	$13,300.00
						2,060 CFM.	1	EA.	$15,500.00	$15,500.00	$15,500.00
						2,400 CFM.	1	EA.	$19,200.00	$19,200.00	$19,200.00
						1,190 CFM.	1	EA.	$9,300.00	$9,300.00	$9,300.00
						280 CFM.	1	EA.	$2,400.00	$2,400.00	$2,400.00
						1,600 CFM.	1	EA.	$12,700.00	$12,700.00	$12,700.00

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Secondary School - Omaha, Nebraska - 18% WWR** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
						690 CFM.	1	EA.	$4,900.00	$4,900.00	$4,900.00
						3,680 CFM.	1	EA.	$22,500.00	$22,500.00	$22,500.00
						1,330 CFM.	2	EA.	$11,000.00	$22,000.00	$22,000.00
						1,060 CFM.	1	EA.	$8,500.00	$8,500.00	$8,500.00
						640 CFM.	1	EA.	$4,800.00	$4,800.00	$4,800.00
Lighting:	ASHRAE 90.1 Space Dependant - T-8 lamps.	530	EA.	$100.00	$53,000.00	ASHRAE 90.1 Space Dependant - T-8 lamps.	530	EA.	$100.00	$53,000.00	$0.00
TOTALS =					**$1,115,913.54**					**$1,135,488.00**	**$19,574.46**

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Warehouse - Chadron, Nebraska** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
General:											
Exterior Wall System	R13 fiberglass batt insulation in 4-inch mtl. studs plus R3.8 continuous rigid insulation.	15,840	S.F.	$3.50	$55,440.00	R21 fiberglass batt insulation in 6-inch mtl. Studs plus R-10 inside and R-10 Ouside (masonry wall) continuous rigid insulation (U=0.049)	15,840	S.F.	$9.00	$142,560.00	$87,120.00
Exterior Roof System	R20 (above deck) polyisocyanurate insulation.	48,000	S.F.	$2.29	$109,920.00	R40 (above deck) polyisocyanurate insulation.	48,000	S.F.	$3.75	$180,000.00	$70,080.00
Exterior Windows	Insulated clear glass; Standard Aluminum frames.	20	S.F.	$41.00	$820.00	Insulated clear glass; Standard Aluminum frames.	20	S.F.	$41.00	$820.00	$0.00
H.V.A.C.											
System 1	Packaged single zone rooftop units and gas-fired unit ventilators (2 tons)	1	EA.	$2,000.00	$2,000.00	DX split system furnace and gas-fired unit ventilators (2 tons)	1	EA.	$3,800.00	$3,800.00	$1,800.00

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Warehouse - Chadron, Nebraska** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
System 2	Packaged single zone rooftop units and gas-fired unit ventilators (4 tons)	1	EA.	$3,400.00	$3,400.00	DX split system furnace and gas-fired unit ventilators (4 tons)	1	EA.	$7,200.00	$7,200.00	$3,800.00
System 3	Packaged single zone rooftop units and gas-fired unit ventilators (6 tons)	1	EA.	$5,100.00	$5,100.00	DX split system furnace and gas-fired unit ventilators (6 tons)	1	EA.	$10,800.00	$10,800.00	$5,700.00
System 4	Packaged single zone rooftop units and gas-fired unit ventilators (4 tons)	1	EA.	$3,400.00	$3,400.00	DX split system furnace and gas-fired unit ventilators (4 tons)	1	EA.	$7,200.00	$7,200.00	$3,800.00
System 5	Packaged single zone rooftop units and gas-fired unit ventilators (6 tons)	1	EA.	$5,100.00	$5,100.00	DX split system furnace and gas-fired unit ventilators (6 tons)	1	EA.	$10,800.00	$10,800.00	$5,700.00
System 6	Packaged single zone rooftop units and gas-fired unit ventilators (6 tons)	1	EA.	$5,100.00	$5,100.00	DX split system furnace and gas-fired unit ventilators (6 tons)	1	EA.	$10,800.00	$10,800.00	$5,700.00

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Warehouse - Chadron, Nebraska** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
Lighting:	Average 0.8 W / ft^2 in warehouse - T-8 lamps.	240	EA.	$100.00	$24,000.00	Average 0.8 W / ft^2 in warehouse. T-8 lamps.	240	EA.	$100.00	$24,000.00	$0.00
TOTALS =					**$214,280.00**					**$397,980.00**	**$183,700.00**

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Warehouse - Norfolk, Nebraska** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
General:											
Exterior Wall System	R13 fiberglass batt insulation in 4-inch mtl. studs plus R3.8 continuous rigid insulation.	15,840	S.F.	$3.50	$55,440.00	R21 fiberglass batt insulation in 6-inch mtl. Studs plus R-10 inside and R-10 Ouside (masonry wall) continuous rigid insulation (U=0.049)	15,840	S.F.	$9.00	$142,560.00	$87,120.00
Exterior Roof System	R20 (above deck) polyisocyanurate insulation.	48,000	S.F.	$2.29	$109,920.00	R40 (above deck) polyisocyanurate insulation.	48,000	S.F.	$3.75	$180,000.00	$70,080.00
Exterior Windows	Insulated clear glass; Standard Aluminum frames.	20	S.F.	$41.00	$820.00	Insulated clear glass; Standard Aluminum frames.	20	S.F.	$41.00	$820.00	$0.00
H.V.A.C.											
System 1	Packaged single zone rooftop units and gas-fired unit ventilators (2 tons)	1	EA.	$2,000.00	$2,000.00	DX split system furnace and gas-fired unit ventilators (2 tons)	1	EA.	$3,800.00	$3,800.00	$1,800.00

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Warehouse - Norfolk, Nebraska** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
System 2	Packaged single zone rooftop units and gas-fired unit ventilators (4 tons)	1	EA.	$3,400.00	$3,400.00	DX split system furnace and gas-fired unit ventilators (4 tons)	1	EA.	$7,200.00	$7,200.00	$3,800.00
System 3	Packaged single zone rooftop units and gas-fired unit ventilators (6 tons)	1	EA.	$5,100.00	$5,100.00	DX split system furnace and gas-fired unit ventilators (6 tons)	1	EA.	$10,800.00	$10,800.00	$5,700.00
System 4	Packaged single zone rooftop units and gas-fired unit ventilators (4 tons)	1	EA.	$3,400.00	$3,400.00	DX split system furnace and gas-fired unit ventilators (4 tons)	1	EA.	$7,200.00	$7,200.00	$3,800.00
System 5	Packaged single zone rooftop units and gas-fired unit ventilators (6 tons)	1	EA.	$5,100.00	$5,100.00	DX split system furnace and gas-fired unit ventilators (6 tons)	1	EA.	$10,800.00	$10,800.00	$5,700.00
System 6	Packaged single zone rooftop units and gas-fired unit ventilators (6 tons)	1	EA.	$5,100.00	$5,100.00	DX split system furnace and gas-fired unit ventilators (6 tons)	1	EA.	$10,800.00	$10,800.00	$5,700.00
Lighting:	Average 0.8 W / ft^2 in warehouse. T-8 lamps.	240	EA.	$100.00	$24,000.00	Average 0.8 W / ft^2 in warehouse. T-8 lamps.	240	EA.	$100.00	$24,000.00	$0.00

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Warehouse - Norfolk, Nebraska** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
TOTALS =					**$214,280.00**					**$397,980.00**	**$183,700.00**

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Warehouse - Omaha, Nebraska** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
General:											
Exterior Wall System	R13 fiberglass batt insulation in 4-inch mtl. studs without continuous rigid insulation.	15,840	S.F.	$2.62	$41,500.80	R21 fiberglass batt insulation in 6-inch mtl. Studs plus R-10 inside and R-10 Ouside (masonry wall) continuous rigid insulation (U=0.049)	15,840	S.F.	$9.00	$142,560.00	$101,059.20
Exterior Roof System	R20 (above deck) polyisocyanurate insulation.	48,000	S.F.	$2.29	$109,920.00	R40 (above deck) polyisocyanurate insulation.	48,000	S.F.	$3.75	$180,000.00	$70,080.00
Exterior Windows	Insulated clear glass; Standard Aluminum frames.	20	S.F.	$41.00	$820.00	Insulated clear glass; Standard Aluminum frames.	20	S.F.	$41.00	$820.00	$0.00
H.V.A.C.											
System 1	Packaged single zone rooftop units and gas-fired unit ventilators (2 tons)	1	EA.	$2,000.00	$2,000.00	DX split system furnace and gas-fired unit ventilators (2 tons)	1	EA.	$3,800.00	$3,800.00	$1,800.00

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Warehouse - Omaha, Nebraska** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
System 2	Packaged single zone rooftop units and gas-fired unit ventilators (4 tons)	1	EA.	$3,400.00	$3,400.00	DX split system furnace and gas-fired unit ventilators (4 tons)	1	EA.	$7,200.00	$7,200.00	$3,800.00
System 3	Packaged single zone rooftop units and gas-fired unit ventilators (6 tons)	1	EA.	$5,100.00	$5,100.00	DX split system furnace and gas-fired unit ventilators (6 tons)	1	EA.	$10,800.00	$10,800.00	$5,700.00
System 4	Packaged single zone rooftop units and gas-fired unit ventilators (4 tons)	1	EA.	$3,400.00	$3,400.00	DX split system furnace and gas-fired unit ventilators (4 tons)	1	EA.	$7,200.00	$7,200.00	$3,800.00
System 5	Packaged single zone rooftop units and gas-fired unit ventilators (6 tons)	1	EA.	$5,100.00	$5,100.00	DX split system furnace and gas-fired unit ventilators (6 tons)	1	EA.	$10,800.00	$10,800.00	$5,700.00
System 6	Packaged single zone rooftop units and gas-fired unit ventilators (6 tons)	1	EA.	$5,100.00	$5,100.00	DX split system furnace and gas-fired unit ventilators (6 tons)	1	EA.	$10,800.00	$10,800.00	$5,700.00
Lighting:	Average 0.8 W / ft^2 in warehouse. T-8 lamps.	240	EA.	$100.00	$24,000.00	Average 0.8 W / ft^2 in warehouse. T-8 lamps.	240	EA.	$100.00	$24,000.00	$0.00

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Warehouse - Omaha, Nebraska** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
TOTALS =					**$200,340.80**					**$397,980.00**	**$197,639.20**

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Large Box Retail - Chadron, Nebraska - 2% WWR** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
General:											
Exterior Wall System	R13 fiberglass batt insulation in 4-inch mtl. studs plus R3.8 continuous rigid insulation.	26,000	S.F.	$3.50	$91,000.00	R19 fiberglass batt insulation in 6-inch mtl. Studs plus R7.5 continuous rigid insulation.	26,000	S.F.	$5.25	$136,500.00	$45,500.00
Exterior Roof System	R20 (above deck) polyisocyanurate insulation.	100,000	S.F.	$2.29	$229,000.00	R30 (above deck) polyisocyanurate insulation.	100,000	S.F.	$2.85	$285,000.00	$56,000.00
Exterior Windows	Interior clear glass; No thermal frames.	520	S.F.	$41.00	$21,320.00	PPG-Solarban (70XL (2) Starphire) insulated glass w/ thermally-broken aluminum frames.	520	S.F.	$56.00	$29,120.00	$7,800.00
H.V.A.C.											
System 1	Packaged rooftop V.A.V. with H.W. reheat - 43 tons.	1	EA.	$86,000.00	$86,000.00	Packaged Single Zone Rooftop Unit - 19 tons.	1	EA.	$19,000.00	$19,000.00	($67,000.00)
	V.A.V. Boxes - 3,700 CFM.	2	EA.	$3,700.00	$7,400.00						($7,400.00)
	V.A.V. Boxes - 2,100 CFM.	2	EA.	$2,100.00	$4,200.00						($4,200.00)
	V.A.V. Boxes - 2,550 CFM.	2	EA.	$2,550.00	$5,100.00						($5,100.00)
	V.A.V. Boxes - 838 CFM.	1	EA.	$800.00	$800.00						($800.00)

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Large Box Retail - Chadron, Nebraska - 2% WWR** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
System 2	Packaged rooftop V.A.V. with H.W. reheat - 47 tons.	1	EA.	$94,000.00	$94,000.00	Packaged Single Zone Rooftop Unit - 8 tons.	1	EA.	$8,000.00	$8,000.00	($86,000.00)
	V.A.V. Boxes - 3,000 CFM.	15	EA.	$3,000.00	$45,000.00						
	V.A.V. Boxes - 800 CFM.	2	EA.	$800.00	$1,600.00						
	V.A.V. Boxes - 3,000 CFM.	4	EA.	$3,000.00	$12,000.00						
System 3	Packaged rooftop V.A.V. with H.W. reheat - 99 tons.	1	EA.	$198,000.00	$198,000.00	Packaged Single Zone Rooftop Unit - 9 tons.	1	EA.	$9,000.00	$9,000.00	($189,000.00)
	V.A.V. Boxes - 3,000 CFM.	13	EA.	$3,000.00	$39,000.00						
System 4	Packaged rooftop V.A.V. with H.W. reheat - 109 tons.	1	EA.	$218,000.00	$218,000.00	Packaged Single Zone Rooftop Unit - 2 tons.	1	EA.	$2,000.00	$2,000.00	($216,000.00)
	V.A.V. Boxes - 3,000 CFM.	14	EA.	$3,000.00	$42,000.00						
System 5						Packaged Single Zone Rooftop Unit - 56 tons.	1	EA.	$56,000.00	$56,000.00	$56,000.00
System 6						Packaged Single Zone Rooftop Unit - 6 tons.	1	EA.	$6,000.00	$6,000.00	$6,000.00

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Large Box Retail - Chadron, Nebraska - 2% WWR** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
System 7						Packaged Single Zone Rooftop Unit - 3 tons.	1	EA.	$3,000.00	$3,000.00	$3,000.00
System 8						Packaged Single Zone Rooftop Unit - 22 tons.	1	EA.	$22,000.00	$22,000.00	$22,000.00
System 9						Packaged Single Zone Rooftop Unit - 61 tons.	1	EA.	$61,000.00	$61,000.00	$61,000.00
						Heat Recovery Units:					
						1,397 CFM.	1	EA.	$11,200.00	$11,200.00	$11,200.00
						853 CFM.	1	EA.	$7,000.00	$7,000.00	$7,000.00
						1,061 CFM.	1	EA.	$8,000.00	$8,000.00	$8,000.00
						154 CFM.	1	EA.	$1,100.00	$1,100.00	$1,100.00
						8,305 CFM.	1	EA.	$60,500.00	$60,500.00	$60,500.00
						456 CFM.	1	EA.	$3,200.00	$3,200.00	$3,200.00
						219 CFM.	1	EA.	$1,600.00	$1,600.00	$1,600.00
						2,486 CFM.	1	EA.	$19,200.00	$19,200.00	$19,200.00
						7,574 CFM.	1	EA.	$55,000.00	$55,000.00	$55,000.00
Boiler	2,300 MBH Gas-fired with hydronic piping.	2	EA.	$45,000.00	$90,000.00						
Lighting:	None					None					
TOTALS =					**$1,184,420.00**					**$803,420.00**	**($381,000.00)**

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Large Box Retail - Norfolk, Nebraska - 2% WWR** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
General:											
Exterior Wall System	R13 fiberglass batt insulation in 4-inch mtl. studs plus R3.8 continuous rigid insulation.	26,000	S.F.	$3.50	$91,000.00	R19 fiberglass batt insulation in 6-inch mtl. Studs plus R7.5 continuous rigid insulation.	26,000	S.F.	$5.25	$136,500.00	$45,500.00
Exterior Roof System	R20 (above deck) polyisocyanurate insulation.	100,000	S.F.	$2.29	$229,000.00	R30 (above deck) polyisocyanurate insulation.	100,000	S.F.	$2.85	$285,000.00	$56,000.00
Exterior Windows	Interior clear glass; No thermal frames.	520	S.F.	$41.00	$21,320.00	PPG-Solarban (70XL (2) Starphire) insulated glass w/ thermally-broken aluminum frames.	520	S.F.	$56.00	$29,120.00	$7,800.00
H.V.A.C.											
System 1	Packaged rooftop V.A.V. with H.W. reheat - 53 tons.	1	EA.	$106,000.00	$106,000.00	Packaged Single Zone Rooftop Unit - 19 tons.	1	EA.	$19,000.00	$19,000.00	($87,000.00)
	V.A.V. Boxes - 2,000 CFM.	4	EA.	$2,000.00	$8,000.00						($8,000.00)
	V.A.V. Boxes - 2,500 CFM.	2	EA.	$2,500.00	$5,000.00						($5,000.00)
	V.A.V. Boxes - 2,500 CFM.	3	EA.	$2,500.00	$7,500.00						($7,500.00)
	V.A.V. Boxes - 906 CFM.	1	EA.	$900.00	$900.00						($900.00)

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Large Box Retail - Norfolk, Nebraska - 2% WWR** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
System 2	Packaged rooftop V.A.V. with H.W. reheat - 53 tons.	1	EA.	$106,000.00	$106,000.00	Packaged Single Zone Rooftop Unit - 11 tons.	1	EA.	$11,000.00	$11,000.00	($95,000.00)
	V.A.V. Boxes - 2,100 CFM.	2	EA.	$2,100.00	$4,200.00						
	V.A.V. Boxes - 1,704 CFM.	1	EA.	$1,700.00	$1,700.00						
	V.A.V. Boxes - 1,900 CFM.	6	EA.	$1,900.00	$11,400.00						
System 3	Packaged rooftop V.A.V. with H.W. reheat - 112 tons.	1	EA.	$168,000.00	$168,000.00	Packaged Single Zone Rooftop Unit - 14 tons.	1	EA.	$14,000.00	$14,000.00	($154,000.00)
	V.A.V. Boxes - 3,000 CFM.	12	EA.	$3,000.00	$36,000.00						
System 4	Packaged rooftop V.A.V. with H.W. reheat - 123 tons.	1	EA.	$184,500.00	$184,500.00	Packaged Single Zone Rooftop Unit - 2 tons.	1	EA.	$2,000.00	$2,000.00	($182,500.00)
	V.A.V. Boxes - 3,000 CFM.	1	EA.	$3,000.00	$3,000.00						
System 5						Packaged Single Zone Rooftop Unit - 77 tons.	1	EA.	$75,000.00	$75,000.00	$75,000.00
System 6						Packaged Single Zone Rooftop Unit - 8 tons.	1	EA.	$8,000.00	$8,000.00	$8,000.00

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Large Box Retail - Norfolk, Nebraska - 2% WWR** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
System 7						Packaged Single Zone Rooftop Unit - 3 tons.	1	EA.	$3,000.00	$3,000.00	$3,000.00
System 8						Packaged Single Zone Rooftop Unit - 28 tons.	1	EA.	$28,000.00	$28,000.00	$28,000.00
System 9						Packaged Single Zone Rooftop Unit - 84 tons.	1	EA.	$80,000.00	$80,000.00	$80,000.00
						Heat Recovery Units:					
						1,397 CFM.	1	EA.	$11,200.00	$11,200.00	$11,200.00
						853 CFM.	1	EA.	$7,000.00	$7,000.00	$7,000.00
						1,061 CFM.	1	EA.	$8,000.00	$8,000.00	$8,000.00
						154 CFM.	1	EA.	$1,100.00	$1,100.00	$1,100.00
						8,305 CFM.	1	EA.	$60,500.00	$60,500.00	$60,500.00
						456 CFM.	1	EA.	$3,200.00	$3,200.00	$3,200.00
						219 CFM.	1	EA.	$1,600.00	$1,600.00	$1,600.00
						2,486 CFM.	1	EA.	$19,200.00	$19,200.00	$19,200.00
						7,574 CFM.	1	EA.	$55,000.00	$55,000.00	$55,000.00
Boiler	2,300 MBH Gas-fired with hydronic piping.	2	EA.	$45,000.00	$90,000.00						
Lighting:	None					None					
TOTALS =					**$1,073,520.00**					**$857,420.00**	**($216,100.00)**

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Large Box Retail - Omaha, Nebraska - 2% WWR** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
General:											
Exterior Wall System	R13 fiberglass batt insulation in 4-inch mtl. studs without continuous rigid insulation.	26,000	S.F.	$2.62	$68,120.00	R19 fiberglass batt insulation in 6-inch mtl. Studs plus R7.5 continuous rigid insulation.	26,000	S.F.	$5.25	$136,500.00	$68,380.00
Exterior Roof System	R20 (above deck) polyisocyanurate insulation.	100,000	S.F.	$2.26	$226,000.00	R30 (above deck) polyisocyanurate insulation.	100,000	S.F.	$2.85	$285,000.00	$59,000.00
Exterior Windows	Interior clear glass; No thermal frames.	520	S.F.	$41.00	$21,320.00	PPG-Solarban (70XL (2) Starphire) insulated glass w/ thermally-broken aluminum frames.	520	S.F.	$56.00	$29,120.00	$7,800.00
H.V.A.C.											
System 1	Packaged rooftop V.A.V. with H.W. reheat - 51 tons.	1	EA.	$102,000.00	$102,000.00	Packaged Single Zone Rooftop Unit - 16 tons.	1	EA.	$16,000.00	$16,000.00	($86,000.00)
	V.A.V. Boxes - 3,300 CFM.	2	EA.	$3,300.00	$6,600.00						($6,600.00)
	V.A.V. Boxes - 2,050 CFM.	2	EA.	$2,050.00	$4,100.00						($4,100.00)
	V.A.V. Boxes - 2,500 CFM.	2	EA.	$2,500.00	$5,000.00						($5,000.00)
	V.A.V. Boxes - 812 CFM.	1	EA.	$800.00	$800.00						($800.00)

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Large Box Retail - Omaha, Nebraska - 2% WWR** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
System 2	Packaged rooftop V.A.V. with H.W. reheat - 52 tons.	1	EA.	$104,000.00	$104,000.00	Packaged Single Zone Rooftop Unit - 10 tons.	1	EA.	$10,000.00	$10,000.00	($94,000.00)
	V.A.V. Boxes - 2,000 CFM.	1	EA.	$2,000.00	$2,000.00						
	V.A.V. Boxes - 750 CFM.	1	EA.	$750.00	$750.00						
	V.A.V. Boxes - 2,200 CFM.	1	EA.	$2,200.00	$2,200.00						
System 3	Packaged rooftop V.A.V. with H.W. reheat - 113 tons.	1	EA.	$169,500.00	$169,500.00	Packaged Single Zone Rooftop Unit - 12 tons.	1	EA.	$12,000.00	$12,000.00	($157,500.00)
	V.A.V. Boxes - 2,900 CFM.	12	EA.	$2,900.00	$34,800.00						
System 4	Packaged rooftop V.A.V. with H.W. reheat - 124 tons.	1	EA.	$186,000.00	$186,000.00	Packaged Single Zone Rooftop Unit - 2 tons.	1	EA.	$2,000.00	$2,000.00	($184,000.00)
	V.A.V. Boxes - 3,200 CFM.	1	EA.	$3,200.00	$3,200.00						
System 5						Packaged Single Zone Rooftop Unit - 68 tons.	1	EA.	$68,000.00	$68,000.00	$68,000.00
System 6						Packaged Single Zone Rooftop Unit - 6 tons.	1	EA.	$6,000.00	$6,000.00	$6,000.00

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Large Box Retail - Omaha, Nebraska - 2% WWR** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
System 7						Packaged Single Zone Rooftop Unit - 3 tons.	1	EA.	$3,000.00	$3,000.00	$3,000.00
System 8						Packaged Single Zone Rooftop Unit - 25 tons.	1	EA.	$25,000.00	$25,000.00	$25,000.00
System 9						Packaged Single Zone Rooftop Unit - 75 tons.	1	EA.	$75,000.00	$75,000.00	$75,000.00
						Heat Recovery Units:					
						1,397 CFM.	1	EA.	$11,200.00	$11,200.00	$11,200.00
						853 CFM.	1	EA.	$7,000.00	$7,000.00	$7,000.00
						1,061 CFM.	1	EA.	$8,000.00	$8,000.00	$8,000.00
						154 CFM.	1	EA.	$1,100.00	$1,100.00	$1,100.00
						8,305 CFM.	1	EA.	$60,500.00	$60,500.00	$60,500.00
						456 CFM.	1	EA.	$3,200.00	$3,200.00	$3,200.00
						219 CFM.	1	EA.	$1,600.00	$1,600.00	$1,600.00
						2,486 CFM.	1	EA.	$19,200.00	$19,200.00	$19,200.00
						7,574 CFM.	1	EA.	$55,000.00	$55,000.00	$55,000.00
Boiler	2,300 MBH Gas-fired with hydronic piping.	2	EA.	$45,000.00	$90,000.00						
Lighting:	None					None					
TOTALS =					**$1,026,390.00**					**$834,420.00**	**($191,970.00)**

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Retail Strip Mall - Chadron, Nebraska** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
General:											
Exterior Wall System	R13 fiberglass batt insulation in 4-inch mtl. studs plus R3.8 continuous rigid insulation.	7,140	S.F.	$3.50	$24,990.00	R13 fiberglass batt insulation in 4-inch mtl. studs plus R10 continuous rigid insulation.	7,140	S.F.	$4.44	$31,701.60	$6,711.60
Exterior Roof System	R20 (above deck) polyisocyanurate insulation.	13,500	S.F.	$2.29	$30,915.00	R20 (above deck) polyisocyanurate insulation.	13,500	S.F.	$2.29	$30,915.00	$0.00
Exterior Windows	Insulated clear glass; Standard Aluminum frames.	1,620	S.F.	$41.00	$66,420.00	PPG-Solarban (70XL (2) Starphire) insulated glass w/ thermally-broken aluminum frames.	1,620	S.F.	$56.00	$90,720.00	$24,300.00
H.V.A.C.											
System 1	Packaged single zone rooftop units (4 tons)	1	EA.	$4,000.00	$4,000.00	DX split system furnace (2 tons)	1	EA.	$3,600.00	$3,600.00	($400.00)
System 2	Packaged single zone rooftop units (2 tons)	1	EA.	$2,000.00	$2,000.00	DX split system furnace (2 tons)	1	EA.	$3,600.00	$3,600.00	$1,600.00

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Retail Strip Mall - Chadron, Nebraska** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
System 3	Packaged single zone rooftop units (1 tons)	1	EA.	$1,000.00	$1,000.00	DX split system furnace (1 tons)	1	EA.	$1,800.00	$1,800.00	$800.00
System 4	Packaged single zone rooftop units (2 tons)	1	EA.	$2,000.00	$2,000.00	DX split system furnace (2 tons)	1	EA.	$3,600.00	$3,600.00	$1,600.00
System 5	Packaged single zone rooftop units (2 tons)	1	EA.	$2,000.00	$2,000.00	DX split system furnace (2 tons)	1	EA.	$3,600.00	$3,600.00	$1,600.00
System 6	Packaged single zone rooftop units (4 tons)	1	EA.	$4,000.00	$4,000.00	DX split system furnace (3 tons)	1	EA.	$5,400.00	$5,400.00	$1,400.00
System 7	Packaged single zone rooftop units (2 tons)	1	EA.	$2,000.00	$2,000.00	DX split system furnace (2 tons)	1	EA.	$3,600.00	$3,600.00	$1,600.00
System 8	Packaged single zone rooftop units (2 tons)	1	EA.	$2,000.00	$2,000.00	DX split system furnace (2 tons)	1	EA.	$3,600.00	$3,600.00	$1,600.00
System 9	Packaged single zone rooftop units (4 tons)	1	EA.	$4,000.00	$4,000.00	DX split system furnace (3 tons)	1	EA.	$5,400.00	$5,400.00	$1,400.00
System 10	Packaged single zone rooftop units (2 tons)	1	EA.	$2,000.00	$2,000.00	DX split system furnace (2 tons)	1	EA.	$3,600.00	$3,600.00	$1,600.00

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Retail Strip Mall - Chadron, Nebraska** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
System 11	Packaged single zone rooftop units (2 tons)	1	EA.	$2,000.00	$2,000.00	DX split system furnace (2 tons)	1	EA.	$3,600.00	$3,600.00	$1,600.00
System 12	Packaged single zone rooftop units (4 tons)	1	EA.	$4,000.00	$4,000.00	DX split system furnace (3 tons)	1	EA.	$5,400.00	$5,400.00	$1,400.00
System 13	Packaged single zone rooftop units (2 tons)	1	EA.	$2,000.00	$2,000.00	DX split system furnace (2 tons)	1	EA.	$3,600.00	$3,600.00	$1,600.00
System 14	Packaged single zone rooftop units (2 tons)	1	EA.	$2,000.00	$2,000.00	DX split system furnace (2 tons)	1	EA.	$3,600.00	$3,600.00	$1,600.00
System 15	Packaged single zone rooftop units (4 tons)	1	EA.	$4,000.00	$4,000.00	DX split system furnace (3 tons)	1	EA.	$5,400.00	$5,400.00	$1,400.00
System 16	Packaged single zone rooftop units (2 tons)	1	EA.	$2,000.00	$2,000.00	DX split system furnace (2 tons)	1	EA.	$3,600.00	$3,600.00	$1,600.00
System 17	Packaged single zone rooftop units (4 tons)	1	EA.	$4,000.00	$4,000.00	DX split system furnace (4 tons)	1	EA.	$7,200.00	$7,200.00	$3,200.00
System 18	Packaged single zone rooftop units (2 tons)	1	EA.	$2,000.00	$2,000.00	DX split system furnace (2 tons)	1	EA.	$3,600.00	$3,600.00	$1,600.00

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Retail Strip Mall - Chadron, Nebraska** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
System 19	Packaged single zone rooftop units (6 tons)	1	EA.	$6,000.00	$6,000.00	DX split system furnace (5 tons)	1	EA.	$9,000.00	$9,000.00	$3,000.00
System 20	Packaged single zone rooftop units (3 tons)	1	EA.	$3,000.00	$3,000.00	DX split system furnace (2 tons)	1	EA.	$3,600.00	$3,600.00	$600.00
System 21	Packaged single zone rooftop units - Kitchen MAU	1	EA.	$10,000.00	$10,000.00	DX split system furnace - Kitchen MAU	1	EA.	$15,000.00	$15,000.00	$5,000.00
						Heat Recovery Units:					
						538 CFM.	1	EA.	$3,900.00	$3,900.00	$3,900.00
						539 CFM.	4	EA.	$3,900.00	$15,600.00	$15,600.00
						2,175 CFM.	1	EA.	$16,000.00	$16,000.00	$16,000.00
Lighting:	1.5 W / ft^2 - T8 Lamps	90	EA.	$100.00	$9,000.00	1.5 W / ft^2 - T8 Lamps	90	EA.	$100.00	$9,000.00	$0.00
TOTALS =					**$197,325.00**					**$299,236.60**	**$101,911.60**

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Retail Strip Mall - Norfolk, Nebraska** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
General:											
Exterior Wall System	R13 fiberglass batt insulation in 4-inch mtl. studs plus R3.8 continuous rigid insulation.	7,140	S.F.	$3.50	$24,990.00	R13 fiberglass batt insulation in 4-inch mtl. studs plus R10 continuous rigid insulation.	7,140	S.F.	$4.44	$31,701.60	$6,711.60
Exterior Roof System	R20 (above deck) polyisocyanurate insulation.	13,500	S.F.	$2.29	$30,915.00	R20 (above deck) polyisocyanurate insulation.	13,500	S.F.	$2.29	$30,915.00	$0.00
Exterior Windows	Insulated clear glass; Standard Aluminum frames.	1,620	S.F.	$41.00	$66,420.00	PPG-Solarban (70XL (2) Starphire) insulated glass w/ thermally-broken aluminum frames.	1,620	S.F.	$56.00	$90,720.00	$24,300.00
H.V.A.C.											
System 1	Packaged single zone rooftop units (4 tons)	1	EA.	$4,000.00	$4,000.00	DX split system furnace (3 tons)	1	EA.	$5,400.00	$5,400.00	$1,400.00
System 2	Packaged single zone rooftop units (2 tons)	1	EA.	$2,000.00	$2,000.00	DX split system furnace (2 tons)	1	EA.	$3,600.00	$3,600.00	$1,600.00

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Retail Strip Mall - Norfolk, Nebraska** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
System 3	Packaged single zone rooftop units (2 tons)	1	EA.	$2,000.00	$2,000.00	DX split system furnace (1 tons)	1	EA.	$1,800.00	$1,800.00	($200.00)
System 4	Packaged single zone rooftop units (2 tons)	1	EA.	$2,000.00	$2,000.00	DX split system furnace (2 tons)	1	EA.	$3,600.00	$3,600.00	$1,600.00
System 5	Packaged single zone rooftop units (2 tons)	1	EA.	$2,000.00	$2,000.00	DX split system furnace (2 tons)	1	EA.	$3,600.00	$3,600.00	$1,600.00
System 6	Packaged single zone rooftop units (5 tons)	1	EA.	$5,000.00	$5,000.00	DX split system furnace (4 tons)	1	EA.	$7,200.00	$7,200.00	$2,200.00
System 7	Packaged single zone rooftop units (2 tons)	1	EA.	$2,000.00	$2,000.00	DX split system furnace (2 tons)	1	EA.	$3,600.00	$3,600.00	$1,600.00
System 8	Packaged single zone rooftop units (2 tons)	1	EA.	$2,000.00	$2,000.00	DX split system furnace (2 tons)	1	EA.	$3,600.00	$3,600.00	$1,600.00
System 9	Packaged single zone rooftop units (5 tons)	1	EA.	$5,000.00	$5,000.00	DX split system furnace (4 tons)	1	EA.	$7,200.00	$7,200.00	$2,200.00
System 10	Packaged single zone rooftop units (2 tons)	1	EA.	$2,000.00	$2,000.00	DX split system furnace (2 tons)	1	EA.	$3,600.00	$3,600.00	$1,600.00

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Retail Strip Mall - Norfolk, Nebraska** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
System 11	Packaged single zone rooftop units (2 tons)	1	EA.	$2,000.00	$2,000.00	DX split system furnace (2 tons)	1	EA.	$3,600.00	$3,600.00	$1,600.00
System 12	Packaged single zone rooftop units (5 tons)	1	EA.	$5,000.00	$5,000.00	DX split system furnace (4 tons)	1	EA.	$7,200.00	$7,200.00	$2,200.00
System 13	Packaged single zone rooftop units (2 tons)	1	EA.	$2,000.00	$2,000.00	DX split system furnace (2 tons)	1	EA.	$3,600.00	$3,600.00	$1,600.00
System 14	Packaged single zone rooftop units (2 tons)	1	EA.	$2,000.00	$2,000.00	DX split system furnace (2 tons)	1	EA.	$3,600.00	$3,600.00	$1,600.00
System 15	Packaged single zone rooftop units (5 tons)	1	EA.	$5,000.00	$5,000.00	DX split system furnace (4 tons)	1	EA.	$7,200.00	$7,200.00	$2,200.00
System 16	Packaged single zone rooftop units (2 tons)	1	EA.	$2,000.00	$2,000.00	DX split system furnace (2 tons)	1	EA.	$3,600.00	$3,600.00	$1,600.00
System 17	Packaged single zone rooftop units (5 tons)	1	EA.	$5,000.00	$5,000.00	DX split system furnace (4 tons)	1	EA.	$7,200.00	$7,200.00	$2,200.00
System 18	Packaged single zone rooftop units (3 tons)	1	EA.	$3,000.00	$3,000.00	DX split system furnace (3 tons)	1	EA.	$5,400.00	$5,400.00	$2,400.00

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Retail Strip Mall - Norfolk, Nebraska** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
System 19	Packaged single zone rooftop units (7 tons)	1	EA.	$7,000.00	$7,000.00	DX split system furnace (6 tons)	1	EA.	$10,800.00	$10,800.00	$3,800.00
System 20	Packaged single zone rooftop units (4 tons)	1	EA.	$4,000.00	$4,000.00	DX split system furnace (3 tons)	1	EA.	$5,400.00	$5,400.00	$1,400.00
System 21	Packaged single zone rooftop units - Kitchen MAU	1	EA.	$10,000.00	$10,000.00	DX split system furnace - Kitchen MAU	1	EA.	$15,000.00	$15,000.00	$5,000.00
						Heat Recovery Units:					
						538 CFM.	1	EA.	$3,900.00	$3,900.00	$3,900.00
						539 CFM.	4	EA.	$3,900.00	$15,600.00	$15,600.00
						2,175 CFM.	1	EA.	$16,000.00	$16,000.00	$16,000.00
Lighting:	1.5 W / ft^2 - T8 Lamps	90	EA.	$100.00	$9,000.00	1.5 W / ft^2 - T8 Lamps	90	EA.	$100.00	$9,000.00	$0.00
TOTALS =					**$206,325.00**					**$313,636.60**	**$107,311.60**

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Retail Strip Mall - Omaha, Nebraska** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
General:											
Exterior Wall System	R13 fiberglass batt insulation in 4-inch mtl. studs without continuous rigid insulation.	7,140	S.F.	$2.62	$18,706.80	R13 fiberglass batt insulation in 4-inch mtl. studs plus R10 continuous rigid insulation.	7,140	S.F.	$4.44	$31,701.60	$12,994.80
Exterior Roof System	R20 (above deck) polyisocyanurate insulation.	13,500	S.F.	$2.29	$30,915.00	R20 (above deck) polyisocyanurate insulation.	13,500	S.F.	$2.29	$30,915.00	$0.00
Exterior Windows	Insulated clear glass; Standard Aluminum frames.	1,620	S.F.	$41.00	$66,420.00	PPG-Solarban (70XL (2) Starphire) insulated glass w/ thermally-broken aluminum frames.	1,620	S.F.	$56.00	$90,720.00	$24,300.00
H.V.A.C.											
System 1	Packaged single zone rooftop units (4 tons)	1	EA.	$4,000.00	$4,000.00	DX split system furnace (3 tons)	1	EA.	$5,400.00	$5,400.00	$1,400.00
System 2	Packaged single zone rooftop units (3 tons)	1	EA.	$3,000.00	$3,000.00	DX split system furnace (2 tons)	1	EA.	$3,600.00	$3,600.00	$600.00

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Retail Strip Mall - Omaha, Nebraska** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
System 3	Packaged single zone rooftop units (2 tons)	1	EA.	$2,000.00	$2,000.00	DX split system furnace (2 tons)	1	EA.	$3,600.00	$3,600.00	$1,600.00
System 4	Packaged single zone rooftop units (2 tons)	1	EA.	$2,000.00	$2,000.00	DX split system furnace (2 tons)	1	EA.	$3,600.00	$3,600.00	$1,600.00
System 5	Packaged single zone rooftop units (2 tons)	1	EA.	$2,000.00	$2,000.00	DX split system furnace (2 tons)	1	EA.	$3,600.00	$3,600.00	$1,600.00
System 6	Packaged single zone rooftop units (5 tons)	1	EA.	$5,000.00	$5,000.00	DX split system furnace (4 tons)	1	EA.	$7,200.00	$7,200.00	$2,200.00
System 7	Packaged single zone rooftop units (3 tons)	1	EA.	$3,000.00	$3,000.00	DX split system furnace (2 tons)	1	EA.	$3,600.00	$3,600.00	$600.00
System 8	Packaged single zone rooftop units (2 tons)	1	EA.	$2,000.00	$2,000.00	DX split system furnace (2 tons)	1	EA.	$3,600.00	$3,600.00	$1,600.00
System 9	Packaged single zone rooftop units (5 tons)	1	EA.	$5,000.00	$5,000.00	DX split system furnace (4 tons)	1	EA.	$7,200.00	$7,200.00	$2,200.00
System 10	Packaged single zone rooftop units (3 tons)	1	EA.	$3,000.00	$3,000.00	DX split system furnace (2 tons)	1	EA.	$3,600.00	$3,600.00	$600.00

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Retail Strip Mall - Omaha, Nebraska** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
System 11	Packaged single zone rooftop units (2 tons)	1	EA.	$2,000.00	$2,000.00	DX split system furnace (2 tons)	1	EA.	$3,600.00	$3,600.00	$1,600.00
System 12	Packaged single zone rooftop units (5 tons)	1	EA.	$5,000.00	$5,000.00	DX split system furnace (5 tons)	1	EA.	$9,000.00	$9,000.00	$4,000.00
System 13	Packaged single zone rooftop units (3 tons)	1	EA.	$3,000.00	$3,000.00	DX split system furnace (2 tons)	1	EA.	$3,600.00	$3,600.00	$600.00
System 14	Packaged single zone rooftop units (2 tons)	1	EA.	$2,000.00	$2,000.00	DX split system furnace (2 tons)	1	EA.	$3,600.00	$3,600.00	$1,600.00
System 15	Packaged single zone rooftop units (5 tons)	1	EA.	$5,000.00	$5,000.00	DX split system furnace (4 tons)	1	EA.	$7,200.00	$7,200.00	$2,200.00
System 16	Packaged single zone rooftop units (3 tons)	1	EA.	$3,000.00	$3,000.00	DX split system furnace (2 tons)	1	EA.	$3,600.00	$3,600.00	$600.00
System 17	Packaged single zone rooftop units (6 tons)	1	EA.	$6,000.00	$6,000.00	DX split system furnace (5 tons)	1	EA.	$9,000.00	$9,000.00	$3,000.00
System 18	Packaged single zone rooftop units (3 tons)	1	EA.	$3,000.00	$3,000.00	DX split system furnace (3 tons)	1	EA.	$5,400.00	$5,400.00	$2,400.00

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Retail Strip Mall - Omaha, Nebraska** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
System 19	Packaged single zone rooftop units (9 tons)	1	EA.	$9,000.00	$9,000.00	DX split system furnace (7 tons)	1	EA.	$12,600.00	$12,600.00	$3,600.00
System 20	Packaged single zone rooftop units (4 tons)	1	EA.	$4,000.00	$4,000.00	DX split system furnace (3 tons)	1	EA.	$5,400.00	$5,400.00	$1,400.00
System 21	Packaged single zone rooftop units - Kitchen MAU	1	EA.	$10,000.00	$10,000.00	DX split system furnace - Kitchen MAU	1	EA.	$15,000.00	$15,000.00	$5,000.00
						Heat Recovery Units:					
						538 CFM.	1	EA.	$3,900.00	$3,900.00	$3,900.00
						539 CFM.	4	EA.	$3,900.00	$15,600.00	$15,600.00
						2,175 CFM.	1	EA.	$16,000.00	$16,000.00	$16,000.00
Lighting:	1.5 W / ft^2 - T8 Lamps	90	EA.	$100.00	$9,000.00	1.5 W / ft^2 - T8 Lamps	90	EA.	$100.00	$9,000.00	$0.00
TOTALS =					**$208,041.80**					**$320,836.60**	**$112,794.80**

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Elementary 18% WWR - Chadron, Nebraska** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
General:											
Exterior Wall System	R13 fiberglass batt insulation in 4-inch mtl. studs plus R3.8 continuous rigid insulation.	13,540	S.F.	$3.50	$47,390.00	R13 fiberglass batt insulation in 4-inch mtl. Studs plus R3.8 continuous rigid insulation.	13,540	S.F.	$3.50	$47,390.00	$0.00
Exterior Roof System	R20 (above deck) polyisocyanurate insulation.	50,000	S.F.	$2.29	$114,500.00	R17 entirely above deck	50,000	S.F.	$2.00	$100,000.00	($14,500.00)
Exterior Windows	Insulated clear glass; Standard Aluminum frames.	2,440	S.F.	$41.00	$100,040.00	Insulated clear glass; Standard Aluminum frames (U=0.57 and SHGC = 0.34).	2,440	S.F.	$41.00	$100,040.00	$0.00
H.V.A.C.											
System 1	Packaged single zone heat pumps (5 tons)	1	EA.	$6,500.00	$6,500.00	Packaged single zone heat pumps (4 tons)	1	EA.	$5,200.00	$5,200.00	($1,300.00)
System 2	Packaged single zone heat pumps (10 tons)	1	EA.	$13,000.00	$13,000.00	Packaged single zone heat pumps (10 tons)	1	EA.	$13,000.00	$13,000.00	$0.00

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Elementary 18% WWR - Chadron, Nebraska** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
System 3	Packaged single zone heat pumps (10 tons)	1	EA.	$13,000.00	$13,000.00	Packaged single zone heat pumps (10 tons)	1	EA.	$13,000.00	$13,000.00	$0.00
System 4	Packaged single zone heat pumps (10 tons)	1	EA.	$13,000.00	$13,000.00	Packaged single zone heat pumps (10 tons)	1	EA.	$13,000.00	$13,000.00	$0.00
System 5	Packaged single zone heat pumps (8 tons)	1	EA.	$10,400.00	$10,400.00	Packaged single zone heat pumps (8 tons)	1	EA.	$10,400.00	$10,400.00	$0.00
System 6	Packaged single zone heat pumps (25 tons)	1	EA.	$32,500.00	$32,500.00	Packaged single zone heat pumps (25 tons)	1	EA.	$32,500.00	$32,500.00	$0.00
System 7	Packaged single zone heat pumps (8 tons)	1	EA.	$10,400.00	$10,400.00	Packaged single zone heat pumps (8 tons)	1	EA.	$10,400.00	$10,400.00	$0.00
System 8	Packaged single zone heat pumps (6 tons)	1	EA.	$7,800.00	$7,800.00	Packaged single zone heat pumps (6 tons)	1	EA.	$7,800.00	$7,800.00	$0.00

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Elementary 18% WWR - Chadron, Nebraska** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
System 9	Packaged single zone heat pumps (4 tons)	1	EA.	$5,200.00	$5,200.00	Packaged single zone heat pumps (4 tons)	1	EA.	$5,200.00	$5,200.00	$0.00
System 10	Packaged single zone heat pumps (10 tons)	1	EA.	$13,000.00	$13,000.00	Packaged single zone heat pumps (10 tons)	1	EA.	$13,000.00	$13,000.00	$0.00
System 11	Packaged single zone heat pumps (4 tons)	1	EA.	$5,200.00	$5,200.00	Packaged single zone heat pumps (4 tons)	1	EA.	$5,200.00	$5,200.00	$0.00
System 12	Packaged single zone heat pumps (10 tons)	1	EA.	$13,000.00	$13,000.00	Packaged single zone heat pumps (10 tons)	1	EA.	$13,000.00	$13,000.00	$0.00
System 13	Packaged single zone heat pumps (9 tons)	1	EA.	$11,700.00	$11,700.00	Packaged single zone heat pumps (9 tons)	1	EA.	$11,700.00	$11,700.00	$0.00
System 14	Packaged single zone heat pumps (3 tons)	1	EA.	$3,900.00	$3,900.00	Packaged single zone heat pumps (3 tons)	1	EA.	$3,900.00	$3,900.00	$0.00

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Elementary 18% WWR - Chadron, Nebraska** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
System 15	Packaged single zone heat pumps (6 tons)	1	EA.	$7,800.00	$7,800.00	Packaged single zone heat pumps (6 tons)	1	EA.	$7,800.00	$7,800.00	$0.00
System 16	Packaged single zone heat pumps (24 tons)	1	EA.	$31,200.00	$31,200.00	Packaged single zone heat pumps (24 tons)	1	EA.	$31,200.00	$31,200.00	$0.00
System 17	Packaged single zone heat pumps (8 tons)	1	EA.	$10,400.00	$10,400.00	Packaged single zone heat pumps (8 tons)	1	EA.	$10,400.00	$10,400.00	$0.00
						Heat Recover Units:					
						550 CFM.	3	EA.	$4,400.00	$13,200.00	$13,200.00
						1790 CFM.	2	EA.	$13,800.00	$27,600.00	$27,600.00
						1,660 CFM.	2	EA.	$12,900.00	$25,800.00	$25,800.00
						1,530 CFM.	1	EA.	$11,800.00	$11,800.00	$11,800.00
						2,840 CFM.	1	EA.	$21,300.00	$21,300.00	$21,300.00
						1,620 CFM.	3	EA.	$12,800.00	$38,400.00	$38,400.00
						1,090 CFM.	1	EA.	$8,700.00	$8,700.00	$8,700.00
						1,440 CFM.	1	EA.	$11,200.00	$11,200.00	$11,200.00
						210 CFM.	1	EA.	$1,600.00	$1,600.00	$1,600.00
						1,030 CFM.	1	EA.	$8,200.00	$8,200.00	$8,200.00
						2,270 CFM.	1	EA.	$18,500.00	$18,500.00	$18,500.00
Lighting:	LPD 1.2 with S.F. T-8 Lamps	330	EA.	$100.00	$33,000.00	LPD 1.2 with S.F. T-8 Lamps	330	EA.	$100.00	$33,000.00	$0.00

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Elementary 18% WWR - Chadron, Nebraska** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
TOTALS =					**$502,930.00**					**$673,430.00**	**$170,500.00**

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Elementary 18% WWR - Norfolk, Nebraska** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
General:											
Exterior Wall System	R13 fiberglass batt insulation in 4-inch mtl. studs plus R3.8 continuous rigid insulation.	13,540	S.F.	$3.50	$47,390.00	R13 fiberglass batt insulation in 4-inch mtl. Studs plus R3.8 continuous rigid insulation.	13,540	S.F.	$3.50	$47,390.00	$0.00
Exterior Roof System	R20 (above deck) polyisocyanurate insulation.	50,000	S.F.	$2.29	$114,500.00	R17 entirely above deck	50,000	S.F.	$2.00	$100,000.00	($14,500.00)
Exterior Windows	Insulated clear glass; Standard Aluminum frames.	2,440	S.F.	$41.00	$100,040.00	Insulated clear glass; Standard Aluminum frames (U=0.57 and SHGC = 0.34).	2,440	S.F.	$41.00	$100,040.00	$0.00
H.V.A.C.											
System 1	Packaged single zone heat pumps (5 tons)	1	EA.	$6,500.00	$6,500.00	Packaged single zone heat pumps (4 tons)	1	EA.	$5,200.00	$5,200.00	($1,300.00)
System 2	Packaged single zone heat pumps (11 tons)	1	EA.	$14,300.00	$14,300.00	Packaged single zone heat pumps (11 tons)	1	EA.	$14,300.00	$14,300.00	$0.00

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Elementary 18% WWR - Norfolk, Nebraska** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
System 3	Packaged single zone heat pumps (11 tons)	1	EA.	$14,300.00	$14,300.00	Packaged single zone heat pumps (11 tons)	1	EA.	$14,300.00	$14,300.00	$0.00
System 4	Packaged single zone heat pumps (11 tons)	1	EA.	$14,300.00	$14,300.00	Packaged single zone heat pumps (11 tons)	1	EA.	$14,300.00	$14,300.00	$0.00
System 5	Packaged single zone heat pumps (9 tons)	1	EA.	$11,700.00	$11,700.00	Packaged single zone heat pumps (9 tons)	1	EA.	$11,700.00	$11,700.00	$0.00
System 6	Packaged single zone heat pumps (28 tons)	1	EA.	$36,400.00	$36,400.00	Packaged single zone heat pumps (28 tons)	1	EA.	$36,400.00	$36,400.00	$0.00
System 7	Packaged single zone heat pumps (10 tons)	1	EA.	$13,000.00	$13,000.00	Packaged single zone heat pumps (10 tons)	1	EA.	$13,000.00	$13,000.00	$0.00
System 8	Packaged single zone heat pumps (7 tons)	1	EA.	$9,100.00	$9,100.00	Packaged single zone heat pumps (7 tons)	1	EA.	$9,100.00	$9,100.00	$0.00

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Elementary 18% WWR - Norfolk, Nebraska** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
System 9	Packaged single zone heat pumps (4 tons)	1	EA.	$5,200.00	$5,200.00	Packaged single zone heat pumps (4 tons)	1	EA.	$5,200.00	$5,200.00	$0.00
System 10	Packaged single zone heat pumps (12 tons)	1	EA.	$15,600.00	$15,600.00	Packaged single zone heat pumps (12 tons)	1	EA.	$15,600.00	$15,600.00	$0.00
System 11	Packaged single zone heat pumps (4 tons)	1	EA.	$5,200.00	$5,200.00	Packaged single zone heat pumps (4 tons)	1	EA.	$5,200.00	$5,200.00	$0.00
System 12	Packaged single zone heat pumps (11 tons)	1	EA.	$14,300.00	$14,300.00	Packaged single zone heat pumps (11 tons)	1	EA.	$14,300.00	$14,300.00	$0.00
System 13	Packaged single zone heat pumps (10 tons)	1	EA.	$13,000.00	$13,000.00	Packaged single zone heat pumps (10 tons)	1	EA.	$13,000.00	$13,000.00	$0.00
System 14	Packaged single zone heat pumps (3 tons)	1	EA.	$3,900.00	$3,900.00	Packaged single zone heat pumps (3 tons)	1	EA.	$3,900.00	$3,900.00	$0.00

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Elementary 18% WWR - Norfolk, Nebraska** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
System 15	Packaged single zone heat pumps (7 tons)	1	EA.	$9,100.00	$9,100.00	Packaged single zone heat pumps (7 tons)	1	EA.	$9,100.00	$9,100.00	$0.00
System 16	Packaged single zone heat pumps (26 tons)	1	EA.	$33,800.00	$33,800.00	Packaged single zone heat pumps (26 tons)	1	EA.	$33,800.00	$33,800.00	$0.00
System 17	Packaged single zone heat pumps (10 tons)	1	EA.	$13,000.00	$13,000.00	Packaged single zone heat pumps (10 tons)	1	EA.	$13,000.00	$13,000.00	$0.00
						Heat Recover Units:					
						550 CFM.	3	EA.	$4,400.00	$13,200.00	$13,200.00
						1790 CFM.	2	EA.	$13,800.00	$27,600.00	$27,600.00
						1,660 CFM.	2	EA.	$12,900.00	$25,800.00	$25,800.00
						1,530 CFM.	1	EA.	$11,800.00	$11,800.00	$11,800.00
						2,840 CFM.	1	EA.	$21,300.00	$21,300.00	$21,300.00
						1,620 CFM.	3	EA.	$12,800.00	$38,400.00	$38,400.00
						1,090 CFM.	1	EA.	$8,700.00	$8,700.00	$8,700.00
						1,440 CFM.	1	EA.	$11,200.00	$11,200.00	$11,200.00
						210 CFM.	1	EA.	$1,600.00	$1,600.00	$1,600.00
						1,030 CFM.	1	EA.	$8,200.00	$8,200.00	$8,200.00
						2,270 CFM.	1	EA.	$18,500.00	$18,500.00	$18,500.00
Lighting:	LPD 1.2 with S.F. T-8 Lamps	330	EA.	$100.00	$33,000.00	LPD 1.2 with S.F. T-8 Lamps	330	EA.	$100.00	$33,000.00	$0.00

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Elementary 18% WWR - Norfolk, Nebraska** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
TOTALS =					**$527,630.00**					**$698,130.00**	**$170,500.00**

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Elementary 18% WWR - Omaha, Nebraska** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
General:											
Exterior Wall System	R13 fiberglass batt insulation in 4-inch mtl. studs without continuous rigid insulation.	13,540	S.F.	$2.62	$35,474.80	R13 fiberglass batt insulation in 4-inch mtl. Studs plus R3.8 continuous rigid insulation.	13,540	S.F.	$3.50	$47,390.00	$11,915.20
Exterior Roof System	R20 (above deck) polyisocyanurate insulation.	50,000	S.F.	$2.29	$114,500.00	R17 entirely above deck	50,000	S.F.	$2.00	$100,000.00	($14,500.00)
Exterior Windows	Insulated clear glass; Standard Aluminum frames.	2,440	S.F.	$41.00	$100,040.00	Insulated clear glass; Standard Aluminum frames (U=0.57 and SHGC = 0.34).	2,440	S.F.	$41.00	$100,040.00	$0.00
H.V.A.C.											
System 1	Packaged single zone heat pumps (5 tons)	1	EA.	$6,500.00	$6,500.00	Packaged single zone heat pumps (4 tons)	1	EA.	$5,200.00	$5,200.00	($1,300.00)
System 2	Packaged single zone heat pumps (14 tons)	1	EA.	$18,200.00	$18,200.00	Packaged single zone heat pumps (14 tons)	1	EA.	$18,200.00	$18,200.00	$0.00

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Elementary 18% WWR - Omaha, Nebraska** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
System 3	Packaged single zone heat pumps (14 tons)	1	EA.	$18,200.00	$18,200.00	Packaged single zone heat pumps (14 tons)	1	EA.	$18,200.00	$18,200.00	$0.00
System 4	Packaged single zone heat pumps (13 tons)	1	EA.	$16,900.00	$16,900.00	Packaged single zone heat pumps (13 tons)	1	EA.	$16,900.00	$16,900.00	$0.00
System 5	Packaged single zone heat pumps (11 tons)	1	EA.	$14,300.00	$14,300.00	Packaged single zone heat pumps (11 tons)	1	EA.	$14,300.00	$14,300.00	$0.00
System 6	Packaged single zone heat pumps (32 tons)	1	EA.	$41,600.00	$41,600.00	Packaged single zone heat pumps (32 tons)	1	EA.	$41,600.00	$41,600.00	$0.00
System 7	Packaged single zone heat pumps (12 tons)	1	EA.	$15,600.00	$15,600.00	Packaged single zone heat pumps (12 tons)	1	EA.	$15,600.00	$15,600.00	$0.00
System 8	Packaged single zone heat pumps (8 tons)	1	EA.	$10,400.00	$10,400.00	Packaged single zone heat pumps (8 tons)	1	EA.	$10,400.00	$10,400.00	$0.00

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Elementary 18% WWR - Omaha, Nebraska** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
System 9	Packaged single zone heat pumps (5 tons)	1	EA.	$6,500.00	$6,500.00	Packaged single zone heat pumps (5 tons)	1	EA.	$6,500.00	$6,500.00	$0.00
System 10	Packaged single zone heat pumps (14 tons)	1	EA.	$18,200.00	$18,200.00	Packaged single zone heat pumps (14 tons)	1	EA.	$18,200.00	$18,200.00	$0.00
System 11	Packaged single zone heat pumps (5 tons)	1	EA.	$6,500.00	$6,500.00	Packaged single zone heat pumps (5 tons)	1	EA.	$6,500.00	$6,500.00	$0.00
System 12	Packaged single zone heat pumps (13 tons)	1	EA.	$16,900.00	$16,900.00	Packaged single zone heat pumps (13 tons)	1	EA.	$16,900.00	$16,900.00	$0.00
System 13	Packaged single zone heat pumps (12 tons)	1	EA.	$15,600.00	$15,600.00	Packaged single zone heat pumps (12 tons)	1	EA.	$15,600.00	$15,600.00	$0.00
System 14	Packaged single zone heat pumps (4 tons)	1	EA.	$5,200.00	$5,200.00	Packaged single zone heat pumps (4 tons)	1	EA.	$5,200.00	$5,200.00	$0.00

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Elementary 18% WWR - Omaha, Nebraska** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
System 15	Packaged single zone heat pumps (8 tons)	1	EA.	$10,400.00	$10,400.00	Packaged single zone heat pumps (8 tons)	1	EA.	$10,400.00	$10,400.00	$0.00
System 16	Packaged single zone heat pumps (30 tons)	1	EA.	$39,000.00	$39,000.00	Packaged single zone heat pumps (30 tons)	1	EA.	$39,000.00	$39,000.00	$0.00
System 17	Packaged single zone heat pumps (12 tons)	1	EA.	$15,600.00	$15,600.00	Packaged single zone heat pumps (12 tons)	1	EA.	$15,600.00	$15,600.00	$0.00
						Heat Recover Units:					
						550 CFM.	3	EA.	$4,400.00	$13,200.00	$13,200.00
						1790 CFM.	2	EA.	$13,800.00	$27,600.00	$27,600.00
						1,660 CFM.	2	EA.	$12,900.00	$25,800.00	$25,800.00
						1,530 CFM.	1	EA.	$11,800.00	$11,800.00	$11,800.00
						2,840 CFM.	1	EA.	$21,300.00	$21,300.00	$21,300.00
						1,620 CFM.	3	EA.	$12,800.00	$38,400.00	$38,400.00
						1,090 CFM.	1	EA.	$8,700.00	$8,700.00	$8,700.00
						1,440 CFM.	1	EA.	$11,200.00	$11,200.00	$11,200.00
						210 CFM.	1	EA.	$1,600.00	$1,600.00	$1,600.00
						1,030 CFM.	1	EA.	$8,200.00	$8,200.00	$8,200.00
						2,270 CFM.	1	EA.	$18,500.00	$18,500.00	$18,500.00
Lighting:	LPD 1.2 with S.F. T-8 Lamps	330	EA.	$100.00	$33,000.00	LPD 1.2 with S.F. T-8 Lamps	330	EA.	$100.00	$33,000.00	$0.00

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Elementary 18% WWR - Omaha, Nebraska** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
TOTALS =					**$558,614.80**					**$741,030.00**	**$182,415.20**

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Small Retail - Chadron, Nebraska - 8% WWR** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
General:											
Exterior Wall System	R13 fiberglass batt insulation in 4-inch mtl. studs plus R3.8 continuous rigid insulation.	4,620	S.F.	$3.50	$16,170.00	R21 fiberglass batt insulation in 6-inch mtl. Studs plus R7.5 continuous rigid insulation.	4,620	S.F.	$5.50	$25,410.00	$9,240.00
Exterior Roof System	R20 (above deck) polyisocyanurate insulation.	5,000	S.F.	$2.29	$11,450.00	R40 (above deck) polyisocyanurate insulation.	5,000	S.F.	$3.75	$18,750.00	$7,300.00
Exterior Windows	Insulated clear glass; Standard Aluminum frames.	370	S.F.	$41.00	$15,170.00	PPG-Solarban (70XL (2) Starphire) insulated glass w/ thermally-broken aluminum frames.	370	S.F.	$56.00	$20,720.00	$5,550.00
H.V.A.C.											
System 1	Packaged rooftop single zone A/C unit with 80% AFUE gas fired heat - 3 ton.	1	EA.	$3,000.00	$3,000.00	CEE Tier-1 - DX split system with residential (90% AFUE) gas-fired furnace - 2 ton.	1	EA.	$3,000.00	$3,000.00	$0.00
System 2	Packaged rooftop single zone A/C unit with 80% AFUE gas fired heat - 5 ton.	1	EA.	$5,000.00	$5,000.00	CEE Tier-1 - DX split system with residential (90% AFUE) gas-fired furnace - 4 ton.	1	EA.	$6,000.00	$6,000.00	$1,000.00

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Small Retail - Chadron, Nebraska - 8% WWR** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
System 3	Packaged rooftop single zone A/C unit with 80% AFUE gas fired heat - 2 ton.	1	EA.	$2,000.00	$2,000.00	CEE Tier-1 - DX split system with residential (90% AFUE) gas-fired furnace - 1 ton.	1	EA.	$1,500.00	$1,500.00	($500.00)
System 4	Packaged rooftop single zone A/C unit with 80% AFUE gas fired heat - 6 ton.	1	EA.	$2,000.00	$2,000.00	CEE Tier-1 - DX split system with residential (90% AFUE) gas-fired furnace - 4 ton.	1	EA.	$6,000.00	$6,000.00	$4,000.00
System 5	Packaged rooftop single zone A/C unit with 80% AFUE gas fired heat - 2 ton.	1	EA.	$2,000.00	$2,000.00	CEE Tier-1 - DX split system with residential (90% AFUE) gas-fired furnace - 1 ton.	1	EA.	$1,500.00	$1,500.00	($500.00)
Lighting:	T-8 Lamps.	130	EA.	$130.00	$16,900.00	T-8 Lamps.	130	EA.	$130.00	$16,900.00	$0.00
TOTALS =					**$73,690.00**					**$99,780.00**	**$26,090.00**

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Small Retail - Norfolk, Nebraska - 8% WWR** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
General:											
Exterior Wall System	R13 fiberglass batt insulation in 4-inch mtl. studs plus R3.8 continuous rigid insulation.	4,620	S.F.	$3.50	$16,170.00	R21 fiberglass batt insulation in 6-inch mtl. Studs plus R7.5 continuous rigid insulation.	4,620	S.F.	$5.50	$25,410.00	$9,240.00
Exterior Roof System	R20 (above deck) polyisocyanurate insulation.	5,000	S.F.	$2.29	$11,450.00	R40 (above deck) polyisocyanurate insulation.	5,000	S.F.	$3.75	$18,750.00	$7,300.00
Exterior Windows	Insulated clear glass; Standard Aluminum frames.	370	S.F.	$41.00	$15,170.00	PPG-Solarban (70XL (2) Starphire) insulated glass w/ thermally-broken aluminum frames.	370	S.F.	$56.00	$20,720.00	$5,550.00
H.V.A.C.											
System 1	Packaged rooftop single zone A/C unit with 80% AFUE gas fired heat - 3 ton.	1	EA.	$3,000.00	$3,000.00	CEE Tier-1 - DX split system with residential (90% AFUE) gas-fired furnace - 3 ton.	1	EA.	$4,500.00	$4,500.00	$1,500.00
System 2	Packaged rooftop single zone A/C unit with 80% AFUE gas fired heat - 6 ton.	1	EA.	$6,500.00	$6,500.00	CEE Tier-1 - DX split system with residential (90% AFUE) gas-fired furnace - 5 ton.	1	EA.	$7,500.00	$7,500.00	$1,000.00

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Small Retail - Norfolk, Nebraska - 8% WWR** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
System 3	Packaged rooftop single zone A/C unit with 80% AFUE gas fired heat - 1 ton.	1	EA.	$2,000.00	$2,000.00	CEE Tier-1 - DX split system with residential (90% AFUE) gas-fired furnace - 2 ton.	1	EA.	$3,000.00	$3,000.00	$1,000.00
System 4	Packaged rooftop single zone A/C unit with 80% AFUE gas fired heat - 6 ton.	1	EA.	$6,500.00	$6,500.00	CEE Tier-1 - DX split system with residential (90% AFUE) gas-fired furnace - 5 ton.	1	EA.	$7,500.00	$7,500.00	$1,000.00
System 5	Packaged rooftop single zone A/C unit with 80% AFUE gas fired heat - 2 ton.	1	EA.	$2,000.00	$2,000.00	CEE Tier-1 - DX split system with residential (90% AFUE) gas-fired furnace - 1 ton.	1	EA.	$1,500.00	$1,500.00	($500.00)
Lighting:	T-8 Lamps.	130	EA.	$130.00	$16,900.00	T-8 Lamps.	130	EA.	$130.00	$16,900.00	$0.00
TOTALS =					**$79,690.00**					**$105,780.00**	**$26,090.00**

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Small Retail - Omaha, Nebraska - 8% WWR** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
General:											
Exterior Wall System	R13 fiberglass batt insulation in 4-inch mtl. studs without continuous rigid insulation.	4,620	S.F.	$3.50	$16,170.00	R21 fiberglass batt insulation in 6-inch mtl. Studs plus R7.5 continuous rigid insulation.	4,620	S.F.	$5.50	$25,410.00	$9,240.00
Exterior Roof System	R19 (above deck) polyisocyanurate insulation.	5,000	S.F.	$2.29	$11,450.00	R40 (above deck) polyisocyanurate insulation.	5,000	S.F.	$3.75	$18,750.00	$7,300.00
Exterior Windows	Insulated clear glass; Standard Aluminum frames.	370	S.F.	$41.00	$15,170.00	PPG-Solarban (70XL (2) Starphire) insulated glass w/ thermally-broken aluminum frames.	370	S.F.	$56.00	$20,720.00	$5,550.00
H.V.A.C.											
System 1	Packaged rooftop single zone A/C unit with 80% AFUE gas fired heat - 3 ton.	1	EA.	$3,000.00	$3,000.00	CEE Tier-1 - DX split system with residential (90% AFUE) gas-fired furnace - 3 ton.	1	EA.	$4,500.00	$4,500.00	$1,500.00
System 2	Packaged rooftop single zone A/C unit with 80% AFUE gas fired heat - 6 ton.	1	EA.	$6,500.00	$6,500.00	CEE Tier-1 - DX split system with residential (90% AFUE) gas-fired furnace - 5 ton.	1	EA.	$4,500.00	$4,500.00	($2,000.00)

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Small Retail - Omaha, Nebraska - 8% WWR** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
System 3	Packaged rooftop single zone A/C unit with 80% AFUE gas fired heat - 1 ton.	1	EA.	$1,500.00	$1,500.00	CEE Tier-1 - DX split system with residential (90% AFUE) gas-fired furnace - 2 ton.	1	EA.	$3,000.00	$3,000.00	$1,500.00
System 4	Packaged rooftop single zone A/C unit with 80% AFUE gas fired heat - 6 ton.	1	EA.	$6,500.00	$6,500.00	CEE Tier-1 - DX split system with residential (90% AFUE) gas-fired furnace - 5 ton.	1	EA.	$7,500.00	$7,500.00	$1,000.00
System 5	Packaged rooftop single zone A/C unit with 80% AFUE gas fired heat - 2 ton.	1	EA.	$2,000.00	$2,000.00	CEE Tier-1 - DX split system with residential (90% AFUE) gas-fired furnace - 1 ton.	1	EA.	$1,500.00	$1,500.00	($500.00)
Lighting:	T-8 Lamps.	130	EA.	$130.00	$16,900.00	T-8 Lamps.	130	EA.	$130.00	$16,900.00	$0.00
TOTALS =					**$79,190.00**					**$102,780.00**	**$23,590.00**

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Small Office - Chadron, Nebraska - 38% WWR** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
General:											
Exterior Wall System	R13 fiberglass batt insulation in 4-inch mtl. studs plus R7 continuous rigid insulation.	5,834	S.F.	$3.97	$23,160.98	R21 fiberglass batt insulation in 6-inch mtl. Studs plus R7.5 continuous rigid insulation.	5,834	S.F.	$5.50	$32,087.00	$8,926.02
Exterior Roof System	R24 (above deck) polyisocyanurate insulation.	10,000	S.F.	$3.02	$30,200.00	R40 (above deck) polyisocyanurate insulation.	10,000	S.F.	$3.75	$37,500.00	$7,300.00
Exterior Windows	Interior clear glass; No thermal frames.	2,217	S.F.	$41.00	$90,897.00	PPG-Solarban 80 with thermally broken aluminum frames - U = 0.41 and SHGC = 0.24	2,217	S.F.	$63.00	$139,671.00	$48,774.00
H.V.A.C.											
System 1	Packaged rooftop single zone - 7 ton.	1	EA.	$8,000.00	$8,000.00	Split system with dedicated E.R.V., 90% EFP furnace - 5 ton.	1	EA.	$9,000.00	$9,000.00	$1,000.00
System 2	Packaged rooftop single zone- 4 ton.	1	EA.	$4,500.00	$4,500.00	Split system with dedicated E.R.V., 90% EFP furnace - 3 ton.	1	EA.	$5,500.00	$5,500.00	$1,000.00

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Small Office - Chadron, Nebraska - 38% WWR** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
System 3	Packaged rooftop single zone - 4 ton.	1	EA.	$4,500.00	$4,500.00	Split system with dedicated E.R.V., 90% EFP furnace - 3 ton.	1	EA.	$5,500.00	$5,500.00	$1,000.00
System 4	Packaged rooftop single zone - 4 ton.	1	EA.	$4,500.00	$4,500.00	Split system with dedicated E.R.V., 90% EFP furnace - 3 ton.	1	EA.	$5,500.00	$5,500.00	$1,000.00
System 5	Packaged rooftop single zone - 8 ton.	1	EA.	$8,500.00	$8,500.00	Split system with dedicated E.R.V., 90% EFP furnace - 7 ton.	1	EA.	$12,500.00	$12,500.00	$4,000.00
						Heat Recovery Unit (total energy wheel type including supply and exhaust fans, controls and associated insulated ductwork) - 890 CFM.	1	EA.	$7,500.00	$7,500.00	$7,500.00
Lighting:	LPD = 1.0 watts / S.F. T-8 lamps.	100	EA.	$100.00	$10,000.00	LPD = 0.8 watts / S.F. T-5 lamps.	100	EA.	$160.00	$16,000.00	$6,000.00
TOTALS =					**$184,257.98**					**$270,758.00**	**$86,500.02**

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Small Office - Norfolk, Nebraska - 38% WWR** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
General:											
Exterior Wall System	R13 fiberglass batt insulation in 4-inch mtl. studs plus R7 continuous rigid insulation.	5,834	S.F.	$3.97	$23,160.98	R21 fiberglass batt insulation in 6-inch mtl. Studs plus R7.5 continuous rigid insulation.	5,834	S.F.	$5.50	$32,087.00	$8,926.02
Exterior Roof System	R24 (above deck) polyisocyanurate insulation.	10,000	S.F.	$3.02	$30,200.00	R40 (above deck) polyisocyanurate insulation.	10,000	S.F.	$3.75	$37,500.00	$7,300.00
Exterior Windows	Interior clear glass; No thermal frames.	2,217	S.F.	$41.00	$90,897.00	PPG-Solarban 80 with thermally broken aluminum frames - U = 0.41 and SHGC = 0.24	2,217	S.F.	$63.00	$139,671.00	$48,774.00
H.V.A.C.											
System 1	Packaged rooftop single zone - 7 ton.	1	EA.	$8,000.00	$8,000.00	Split system with dedicated E.R.V., 90% EFP furnace - 5 ton.	1	EA.	$9,000.00	$9,000.00	$1,000.00
System 2	Packaged rooftop single zone- 4 ton.	1	EA.	$4,500.00	$4,500.00	Split system with dedicated E.R.V., 90% EFP furnace - 3 ton.	1	EA.	$5,500.00	$5,500.00	$1,000.00
System 3	Packaged rooftop single zone - 3 ton.	1	EA.	$3,000.00	$3,000.00	Split system with dedicated E.R.V., 90% EFP furnace - 5 ton.	1	EA.	$9,000.00	$9,000.00	$6,000.00

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Small Office - Norfolk, Nebraska - 38% WWR** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
System 4	Packaged rooftop single zone - 4 ton.	1	EA.	$4,500.00	$4,500.00	Split system with dedicated E.R.V., 90% EFP furnace - 3 ton.	1	EA.	$5,500.00	$5,500.00	$1,000.00
System 5	Packaged rooftop single zone - 9 ton.	1	EA.	$9,000.00	$9,000.00	Split system with dedicated E.R.V., 90% EFP furnace - 7 ton.	1	EA.	$12,500.00	$12,500.00	$3,500.00
						Heat Recovery Unit (total energy wheel type including supply and exhaust fans, controls and associated insulated ductwork) - 890 CFM.	1	EA.	$7,500.00	$7,500.00	$7,500.00
Lighting:	LPD = 1.0 watts / S.F. T-8 lamps.	100	EA.	$100.00	$10,000.00	LPD = 0.8 watts / S.F. T-5 lamps.	100	EA.	$160.00	$16,000.00	$6,000.00
TOTALS =					**$183,257.98**					**$274,258.00**	**$91,000.02**

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Small Office - Omaha, Nebraska - 38% WWR** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
General:											
Exterior Wall System	R13 fiberglass batt insulation in 4-inch mtl. studs without continuous rigid insulation.	5,834	S.F.	$2.62	$15,285.08	R21 fiberglass batt insulation in 6-inch mtl. Studs plus R7.5 continuous rigid insulation.	5,834	S.F.	$5.50	$32,087.00	$16,801.92
Exterior Roof System	R24 (above deck) polyisocyanurate insulation.	10,000	S.F.	$3.02	$30,200.00	R40 (above deck) polyisocyanurate insulation.	10,000	S.F.	$3.75	$37,500.00	$7,300.00
Exterior Windows	Interior clear glass; No thermal frames.	2,217	S.F.	$41.00	$90,897.00	PPG-Solarban 80 with thermally broken aluminum frames - U = 0.41 and SHGC = 0.24	2,217	S.F.	$63.00	$139,671.00	$48,774.00
H.V.A.C.											
System 1	Packaged rooftop single zone - 8 ton.	1	EA.	$8,500.00	$8,500.00	Split system with dedicated E.R.V., 90% EFP furnace - 5 ton.	1	EA.	$9,000.00	$9,000.00	$500.00
System 2	Packaged rooftop single zone- 4 ton.	1	EA.	$4,500.00	$4,500.00	Split system with dedicated E.R.V., 90% EFP furnace - 3 ton.	1	EA.	$5,500.00	$5,500.00	$1,000.00

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Small Office - Omaha, Nebraska - 38% WWR** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
System 3	Packaged rooftop single zone - 5 ton.	1	EA.	$5,000.00	$5,000.00	Split system with dedicated E.R.V., 90% EFP furnace - 4 ton.	1	EA.	$7,500.00	$7,500.00	$2,500.00
System 4	Packaged rooftop single zone - 4 ton.	1	EA.	$4,500.00	$4,500.00	Split system with dedicated E.R.V., 90% EFP furnace - 3 ton.	1	EA.	$5,500.00	$5,500.00	$1,000.00
System 5	Packaged rooftop single zone - 9 ton.	1	EA.	$9,000.00	$9,000.00	Split system with dedicated E.R.V., 90% EFP furnace - 7 ton.	1	EA.	$12,500.00	$12,500.00	$3,500.00
						Heat Recovery Unit (total energy wheel type including supply and exhaust fans, controls and associated insulated ductwork) - 890 CFM.	1	EA.	$7,500.00	$7,500.00	$7,500.00
Lighting:	LPD = 1.0 watts / S.F. T-8 lamps.	100	EA.	$100.00	$10,000.00	LPD = 0.8 watts / S.F. T-5 lamps.	100	EA.	$160.00	$16,000.00	$6,000.00
TOTALS =					**$177,882.08**					**$272,758.00**	**$94,875.92**

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Small Office - Chadron, Nebraska - 18% WWR** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
General:											
Exterior Wall System	R13 fiberglass batt insulation in 4-inch mtl. studs plus R3.8 continuous rigid insulation.	5,834	S.F.	$3.50	$20,419.00	R21 fiberglass batt insulation in 6-inch mtl. Studs plus R7.5 continuous rigid insulation.	5,834	S.F.	$5.50	$32,087.00	$11,668.00
Exterior Roof System	R20 (above deck) polyisocyanurate insulation.	10,000	S.F.	$2.29	$22,900.00	R40 (above deck) polyisocyanurate insulation.	10,000	S.F.	$3.75	$37,500.00	$14,600.00
Exterior Windows	Interior clear glass; No thermal frames.	2,217	S.F.	$41.00	$90,897.00	PPG-Solarban (70XL (2) Starphire) insulated glass w/ thermally-broken aluminum frames.	2,217	S.F.	$56.00	$124,152.00	$33,255.00
H.V.A.C.											
System 1	Packaged rooftop single zone - 5 ton.	1	EA.	$9,000.00	$9,000.00	Split system with dedicated E.R.V., 90% EFP furnace - 4 ton.	1	EA.	$7,500.00	$7,500.00	($1,500.00)
System 2	Packaged rooftop single zone- 3 ton.	1	EA.	$3,000.00	$3,000.00	Split system with dedicated E.R.V., 90% EFP furnace - 2 ton.	1	EA.	$3,500.00	$3,500.00	$500.00

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Small Office - Chadron, Nebraska - 18% WWR** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
System 3	Packaged rooftop single zone - 4 ton.	1	EA.	$4,500.00	$4,500.00	Split system with dedicated E.R.V., 90% EFP furnace - 3 ton.	1	EA.	$5,500.00	$5,500.00	$1,000.00
System 4	Packaged rooftop single zone - 3 ton.	1	EA.	$3,000.00	$3,000.00	Split system with dedicated E.R.V., 90% EFP furnace - 2 ton.	1	EA.	$3,500.00	$3,500.00	$500.00
System 5	Packaged rooftop single zone - 8 ton.	1	EA.	$8,500.00	$8,500.00	Split system with dedicated E.R.V., 90% EFP furnace - 7 ton.	1	EA.	$12,500.00	$12,500.00	$4,000.00
						Heat Recovery Unit (total energy wheel type including supply and exhaust fans, controls and associated insulated ductwork) - 890 CFM.	1	EA.	$7,500.00	$7,500.00	$7,500.00
Lighting:	LPD = 1.0 watts / S.F. T-8 lamps.	100	EA.	$100.00	$10,000.00	LPD = 0.8 watts / S.F. T-5 lamps.	100	EA.	$160.00	$16,000.00	$6,000.00
TOTALS =					**$172,216.00**					**$249,739.00**	**$77,523.00**

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Small Office - Norfolk, Nebraska - 18% WWR** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
General:											
Exterior Wall System	R13 fiberglass batt insulation in 4-inch mtl. studs plus R3.8 continuous rigid insulation.	5,834	S.F.	$3.50	$20,419.00	R21 fiberglass batt insulation in 6-inch mtl. Studs plus R7.5 continuous rigid insulation.	5,834	S.F.	$5.50	$32,087.00	$11,668.00
Exterior Roof System	R20 (above deck) polyisocyanurate insulation.	10,000	S.F.	$2.29	$22,900.00	R40 (above deck) polyisocyanurate insulation.	10,000	S.F.	$3.75	$37,500.00	$14,600.00
Exterior Windows	Interior clear glass; No thermal frames.	2,217	S.F.	$41.00	$90,897.00	PPG-Solarban (70XL (2) Starphire) insulated glass w/ thermally-broken aluminum frames.	2,217	S.F.	$56.00	$124,152.00	$33,255.00
H.V.A.C.											
System 1	Packaged rooftop single zone - 5 ton.	1	EA.	$9,000.00	$9,000.00	Split system with dedicated E.R.V., 90% EFP furnace - 4 ton.	1	EA.	$7,500.00	$7,500.00	($1,500.00)
System 2	Packaged rooftop single zone- 3 ton.	1	EA.	$3,000.00	$3,000.00	Split system with dedicated E.R.V., 90% EFP furnace - 2 ton.	1	EA.	$3,500.00	$3,500.00	$500.00

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Small Office - Norfolk, Nebraska - 18% WWR** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
System 3	Packaged rooftop single zone - 4 ton.	1	EA.	$4,500.00	$4,500.00	Split system with dedicated E.R.V., 90% EFP furnace - 3 ton.	1	EA.	$5,500.00	$5,500.00	$1,000.00
System 4	Packaged rooftop single zone - 3 ton.	1	EA.	$3,000.00	$3,000.00	Split system with dedicated E.R.V., 90% EFP furnace - 2 ton.	1	EA.	$3,500.00	$3,500.00	$500.00
System 5	Packaged rooftop single zone - 9 ton.	1	EA.	$9,000.00	$9,000.00	Split system with dedicated E.R.V., 90% EFP furnace - 7 ton.	1	EA.	$12,500.00	$12,500.00	$3,500.00
						Heat Recovery Unit (total energy wheel type including supply and exhaust fans, controls and associated insulated ductwork) - 890 CFM.	1	EA.	$7,500.00	$7,500.00	$7,500.00
Lighting:	LPD = 1.0 with S.F. T-8 lamps.	100	EA.	$100.00	$10,000.00	LPD = 0.8 with S.F. T-5 lamps.	100	EA.	$160.00	$16,000.00	$6,000.00
TOTALS =					**$172,716.00**					**$249,739.00**	**$77,023.00**

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Small Office - Omaha, Nebraska - 18% WWR** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
General:											
Exterior Wall System	R13 fiberglass batt insulation in 4-inch mtl. studs without continuous rigid insulation.	5,834	S.F.	$2.62	$15,285.08	R21 fiberglass batt insulation in 6-inch mtl. Studs plus R7.5 continuous rigid insulation.	5,834	S.F.	$5.50	$32,087.00	$16,801.92
Exterior Roof System	R20 (above deck) polyisocyanurate insulation.	10,000	S.F.	$2.29	$22,900.00	R40 (above deck) polyisocyanurate insulation.	10,000	S.F.	$3.75	$37,500.00	$14,600.00
Exterior Windows	Interior clear glass; No thermal frames.	2,217	S.F.	$41.00	$90,897.00	PPG-Solarban (70XL (2) Starphire) insulated glass w/ thermally-broken aluminum frames.	2,217	S.F.	$56.00	$124,152.00	$33,255.00
H.V.A.C.											
System 1	Packaged rooftop single zone - 5 ton.	1	EA.	$9,000.00	$9,000.00	Split system with dedicated E.R.V., 90% EFP furnace - 4 ton.	1	EA.	$7,500.00	$7,500.00	($1,500.00)
System 2	Packaged rooftop single zone- 3 ton.	1	EA.	$3,000.00	$3,000.00	Split system with dedicated E.R.V., 90% EFP furnace - 2 ton.	1	EA.	$3,500.00	$3,500.00	$500.00

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Small Office - Omaha, Nebraska - 18% WWR** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
System 3	Packaged rooftop single zone - 4 ton.	1	EA.	$4,500.00	$4,500.00	Split system with dedicated E.R.V., 90% EFP furnace - 3 ton.	1	EA.	$5,500.00	$5,500.00	$1,000.00
System 4	Packaged rooftop single zone - 3 ton.	1	EA.	$3,000.00	$3,000.00	Split system with dedicated E.R.V., 90% EFP furnace - 2 ton.	1	EA.	$3,500.00	$3,500.00	$500.00
System 5	Packaged rooftop single zone - 9 ton.	1	EA.	$9,000.00	$9,000.00	Split system with dedicated E.R.V., 90% EFP furnace - 7 ton.	1	EA.	$12,500.00	$12,500.00	$3,500.00
						Heat Recovery Unit (total energy wheel type including supply and exhaust fans, controls and associated insulated ductwork) - 890 CFM.	1	EA.	$7,500.00	$7,500.00	$7,500.00
Lighting:	LPD = 1.0 with S.F. T-8 lamps.	100	EA.	$100.00	$10,000.00	LPD = 0.8 with S.F. T-5 lamps.	100	EA.	$160.00	$16,000.00	$6,000.00
TOTALS =					**$167,582.08**					**$249,739.00**	**$82,156.92**

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Large Office - Chadron, Nebraska - 38% WWR** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
General:											
Exterior Wall System	R13 fiberglass batt insulation in 4-inch mtl. studs plus R7 continuous rigid insulation.	21,600	S.F.	$3.97	$85,752.00	R13 fiberglass batt insulation in 4-inch mtl. Studs plus R3.8 continuous rigid insulation.	21,600	S.F.	$3.50	$75,600.00	($10,152.00)
Exterior Roof System	R24 (above deck) polyisocyanurate insulation.	20,000	S.F.	$3.02	$60,400.00	R15 (above deck) polyisocyanurate insulation.	20,000	S.F.	$1.75	$35,000.00	($25,400.00)
Exterior Windows	Interior clear glass; No thermal frames.	8,208	S.F.	$41.00	$336,528.00	PPG-Solarban (70XL (2) Starphire) insulated glass w/ thermally-broken aluminum frames.	8,208	S.F.	$56.00	$459,648.00	$123,120.00
H.V.A.C.											
System 1	Packaged rooftop single zone - 10 ton.	1	EA.	$10,000.00	$10,000.00	Packaged V.A.V. with electrical reheat system fans with V.S.D. - 48 ton.	1	EA.	$96,000.00	$96,000.00	$86,000.00
						V.A.V. Boxes - 3,393 CFM.	1	EA.	$3,400.00	$3,400.00	$3,400.00
						V.A.V. Boxes - 1,604 CFM.	1	EA.	$1,600.00	$1,600.00	$1,600.00
						V.A.V. Boxes - 2,056 CFM.	1	EA.	$2,100.00	$2,100.00	$2,100.00

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Large Office - Chadron, Nebraska - 38% WWR** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
						V.A.V. Boxes - 1,646 CFM.	1	EA.	$1,700.00	$1,700.00	$1,700.00
						V.A.V. Boxes - 3,500 CFM.	2	EA.	$3,500.00	$7,000.00	$7,000.00
System 2	Packaged rooftop single zone- 5 ton.	1	EA.	$5,000.00	$5,000.00	Packaged V.A.V. with electrical reheat system fans with V.S.D. - 53 ton.	1	EA.	$106,000.00	$106,000.00	$101,000.00
						V.A.V. Boxes - 2,100 CFM.	2	EA.	$2,100.00	$4,200.00	$4,200.00
						V.A.V. Boxes - 1,904 CFM.	1	EA.	$1,900.00	$1,900.00	$1,900.00
						V.A.V. Boxes - 2,390 CFM.	1	EA.	$2,400.00	$2,400.00	$2,400.00
						V.A.V. Boxes - 1,827 CFM.	1	EA.	$1,800.00	$1,800.00	$1,800.00
						V.A.V. Boxes - 3,500 CFM.	2	EA.	$3,500.00	$7,000.00	$7,000.00
System 3	Packaged rooftop single zone - 6 ton.	1	EA.	$6,500.00	$6,500.00	Packaged V.A.V. with electrical reheat system fans with V.S.D. - 57 ton.	1	EA.	$114,000.00	$114,000.00	$107,500.00
						V.A.V. Boxes - 2,100 CFM.	1	EA.	$2,100.00	$2,100.00	$2,100.00
						V.A.V. Boxes - 1,904 CFM.	1	EA.	$1,900.00	$1,900.00	$1,900.00
						V.A.V. Boxes - 2,390 CFM.	1	EA.	$2,400.00	$2,400.00	$2,400.00

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Large Office - Chadron, Nebraska - 38% WWR** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
						V.A.V. Boxes - 1,827 CFM.	1	EA.	$1,800.00	$1,800.00	$1,800.00
						V.A.V. Boxes - 3,500 CFM.	2	EA.	$3,500.00	$7,000.00	$7,000.00
System 4	Packaged rooftop single zone - 5 ton.	1	EA.	$5,000.00	$5,000.00						
System 5	Packaged rooftop single zone - 17 ton.	1	EA.	$17,000.00	$17,000.00						
System 6	Packaged rooftop single zone - 12 ton.	1	EA.	$12,000.00	$12,000.00						
System 7	Packaged rooftop single zone - 6 ton.	1	EA.	$6,500.00	$6,500.00						
System 8	Packaged rooftop single zone - 7 ton.	1	EA.	$8,000.00	$8,000.00						
System 9	Packaged rooftop single zone - 6 ton.	1	EA.	$6,500.00	$6,500.00						
System 10	Packaged rooftop single zone - 17 ton.	1	EA.	$17,000.00	$17,000.00						
System 11	Packaged rooftop single zone - 13 ton.	1	EA.	$13,000.00	$13,000.00						

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Large Office - Chadron, Nebraska - 38% WWR** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
System 12	Packaged rooftop single zone - 6 ton.	1	EA.	$6,500.00	$6,500.00						
System 13	Packaged rooftop single zone - 21 ton.	1	EA.	$20,000.00	$20,000.00						
System 14	Packaged rooftop single zone - 6 ton.	1	EA.	$6,500.00	$6,500.00						
System 15	Packaged rooftop single zone - 21 ton.	1	EA.	$20,000.00	$20,000.00						
Lighting:	None					None					
TOTALS =					**$642,180.00**					**$934,548.00**	**$292,368.00**

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Large Office - Norfolk, Nebraska - 38% WWR** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
General:											
Exterior Wall System	R13 fiberglass batt insulation in 4-inch mtl. studs plus R7 continuous rigid insulation.	21,600	S.F.	$3.97	$85,752.00	R13 fiberglass batt insulation in 4-inch mtl. Studs plus R3.8 continuous rigid insulation.	21,600	S.F.	$3.50	$75,600.00	($10,152.00)
Exterior Roof System	R24 (above deck) polyisocyanurate insulation.	20,000	S.F.	$3.02	$60,400.00	R15 (above deck) polyisocyanurate insulation.	20,000	S.F.	$1.75	$35,000.00	($25,400.00)
Exterior Windows	Interior clear glass; No thermal frames.	8,208	S.F.	$41.00	$336,528.00	PPG-Solarban (70XL (2) Starphire) insulated glass w/ thermally-broken aluminum frames.	8,208	S.F.	$56.00	$459,648.00	$123,120.00
H.V.A.C.											
System 1	Packaged rooftop single zone - 11 ton.	1	EA.	$11,000.00	$11,000.00	Packaged V.A.V. with electrical reheat system fans with V.S.D. - 49 ton.	1	EA.	$98,500.00	$98,500.00	$87,500.00
						V.A.V. Boxes - 3,393 CFM.	1	EA.	$3,400.00	$3,400.00	$3,400.00
						V.A.V. Boxes - 1,604 CFM.	1	EA.	$1,600.00	$1,600.00	$1,600.00
						V.A.V. Boxes - 2,056 CFM.	1	EA.	$2,100.00	$2,100.00	$2,100.00

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Large Office - Norfolk, Nebraska - 38% WWR** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
						V.A.V. Boxes - 1,646 CFM.	1	EA.	$1,700.00	$1,700.00	$1,700.00
						V.A.V. Boxes - 3,500 CFM.	2	EA.	$3,500.00	$7,000.00	$7,000.00
System 2	Packaged rooftop single zone- 5 ton.	1	EA.	$5,000.00	$5,000.00	Packaged V.A.V. with electrical reheat system fans with V.S.D. - 53 ton.	1	EA.	$106,000.00	$106,000.00	$101,000.00
						V.A.V. Boxes - 2,100 CFM.	2	EA.	$2,100.00	$4,200.00	$4,200.00
						V.A.V. Boxes - 1,904 CFM.	1	EA.	$1,900.00	$1,900.00	$1,900.00
						V.A.V. Boxes - 2,390 CFM.	1	EA.	$2,400.00	$2,400.00	$2,400.00
						V.A.V. Boxes - 1,827 CFM.	1	EA.	$1,800.00	$1,800.00	$1,800.00
						V.A.V. Boxes - 3,500 CFM.	2	EA.	$3,500.00	$7,000.00	$7,000.00
System 3	Packaged rooftop single zone - 7 ton.	1	EA.	$8,000.00	$8,000.00	Packaged V.A.V. with electrical reheat system fans with V.S.D. - 57 ton.	1	EA.	$114,000.00	$114,000.00	$106,000.00
						V.A.V. Boxes - 2,100 CFM.	2	EA.	$2,100.00	$4,200.00	$4,200.00
						V.A.V. Boxes - 1,904 CFM.	1	EA.	$1,900.00	$1,900.00	$1,900.00
						V.A.V. Boxes - 2,390 CFM.	1	EA.	$2,400.00	$2,400.00	$2,400.00

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Large Office - Norfolk, Nebraska - 38% WWR** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
						V.A.V. Boxes - 1,827 CFM.	1	EA.	$1,800.00	$1,800.00	$1,800.00
						V.A.V. Boxes - 3,500 CFM.	2	EA.	$3,500.00	$7,000.00	$7,000.00
System 4	Packaged rooftop single zone - 5 ton.	1	EA.	$5,000.00	$5,000.00						
System 5	Packaged rooftop single zone - 20 ton.	1	EA.	$19,000.00	$19,000.00						
System 6	Packaged rooftop single zone - 13 ton.	1	EA.	$13,000.00	$13,000.00						
System 7	Packaged rooftop single zone - 6 ton.	1	EA.	$6,500.00	$6,500.00						
System 8	Packaged rooftop single zone - 7 ton.	1	EA.	$8,000.00	$8,000.00						
System 9	Packaged rooftop single zone - 6 ton.	1	EA.	$6,500.00	$6,500.00						
System 10	Packaged rooftop single zone - 20 ton.	1	EA.	$19,000.00	$19,000.00						
System 11	Packaged rooftop single zone - 14 ton.	1	EA.	$14,000.00	$14,000.00						

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Large Office - Norfolk, Nebraska - 38% WWR** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
System 12	Packaged rooftop single zone - 7 ton.	1	EA.	$8,000.00	$8,000.00						
System 13	Packaged rooftop single zone - 8 ton.	1	EA.	$8,500.00	$8,500.00						
System 14	Packaged rooftop single zone - 6 ton.	1	EA.	$6,500.00	$6,500.00						
System 15	Packaged rooftop single zone - 23 ton.	1	EA.	$22,000.00	$22,000.00						
Lighting:	None					None					
TOTALS =					**$642,680.00**					**$939,148.00**	**$296,468.00**

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Large Office - Omaha, Nebraska - 38% WWR** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
General:											
Exterior Wall System	R13 fiberglass batt insulation in 4-inch mtl. studs without continuous rigid insulation.	21,600	S.F.	$2.62	$56,592.00	R13 fiberglass batt insulation in 4-inch mtl. Studs plus R3.8 continuous rigid insulation.	21,600	S.F.	$3.50	$75,600.00	$19,008.00
Exterior Roof System	R24 (above deck) polyisocyanurate insulation.	20,000	S.F.	$3.02	$60,400.00	R15 (above deck) polyisocyanurate insulation.	20,000	S.F.	$1.75	$35,000.00	($25,400.00)
Exterior Windows	Interior clear glass; No thermal frames.	8,208	S.F.	$41.00	$336,528.00	PPG-Solarban (70XL (2) Starphire) insulated glass w/ thermally-broken aluminum frames.	8,208	S.F.	$56.00	$459,648.00	$123,120.00
H.V.A.C.											
System 1	Packaged rooftop single zone - 11 ton.	1	EA.	$11,000.00	$11,000.00	Packaged V.A.V. with electrical reheat system fans with V.S.D. - 49 ton.	1	EA.	$98,500.00	$98,500.00	$87,500.00
						V.A.V. Boxes - 3,393 CFM.	1	EA.	$3,400.00	$3,400.00	$3,400.00
						V.A.V. Boxes - 1,604 CFM.	1	EA.	$1,600.00	$1,600.00	$1,600.00
						V.A.V. Boxes - 2,056 CFM.	1	EA.	$2,100.00	$2,100.00	$2,100.00

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Large Office - Omaha, Nebraska - 38% WWR** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
						V.A.V. Boxes - 1,646 CFM.	1	EA.	$1,700.00	$1,700.00	$1,700.00
						V.A.V. Boxes - 3,500 CFM.	2	EA.	$3,500.00	$7,000.00	$7,000.00
System 2	Packaged rooftop single zone- 5 ton.	1	EA.	$5,000.00	$5,000.00	Packaged V.A.V. with electrical reheat system fans with V.S.D. - 53 ton.	1	EA.	$106,000.00	$106,000.00	$101,000.00
						V.A.V. Boxes - 2,100 CFM.	2	EA.	$2,100.00	$4,200.00	$4,200.00
						V.A.V. Boxes - 1,904 CFM.	1	EA.	$1,900.00	$1,900.00	$1,900.00
						V.A.V. Boxes - 2,390 CFM.	1	EA.	$2,400.00	$2,400.00	$2,400.00
						V.A.V. Boxes - 1,827 CFM.	1	EA.	$1,800.00	$1,800.00	$1,800.00
						V.A.V. Boxes - 3,500 CFM.	2	EA.	$3,500.00	$7,000.00	$7,000.00
System 3	Packaged rooftop single zone - 7 ton.	1	EA.	$8,000.00	$8,000.00	Packaged V.A.V. with electrical reheat system fans with V.S.D. - 57 ton.	1	EA.	$114,000.00	$114,000.00	$106,000.00
						V.A.V. Boxes - 2,100 CFM.	2	EA.	$2,100.00	$4,200.00	$4,200.00
						V.A.V. Boxes - 1,904 CFM.	1	EA.	$1,900.00	$1,900.00	$1,900.00
						V.A.V. Boxes - 2,390 CFM.	1	EA.	$2,400.00	$2,400.00	$2,400.00

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Large Office - Omaha, Nebraska - 38% WWR** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
						V.A.V. Boxes - 1,827 CFM.	1	EA.	$1,800.00	$1,800.00	$1,800.00
						V.A.V. Boxes - 3,500 CFM.	2	EA.	$3,500.00	$7,000.00	$7,000.00
System 4	Packaged rooftop single zone - 5 ton.	1	EA.	$5,000.00	$5,000.00						
System 5	Packaged rooftop single zone - 22 ton.	1	EA.	$21,000.00	$21,000.00						
System 6	Packaged rooftop single zone - 13 ton.	1	EA.	$13,000.00	$13,000.00						
System 7	Packaged rooftop single zone - 6 ton.	1	EA.	$6,500.00	$6,500.00						
System 8	Packaged rooftop single zone - 8 ton.	1	EA.	$8,000.00	$8,000.00						
System 9	Packaged rooftop single zone - 6 ton.	1	EA.	$6,500.00	$6,500.00						
System 10	Packaged rooftop single zone - 22 ton.	1	EA.	$21,000.00	$21,000.00						
System 11	Packaged rooftop single zone - 14 ton.	1	EA.	$13,000.00	$13,000.00						

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Large Office - Omaha, Nebraska - 38% WWR** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
System 12	Packaged rooftop single zone - 7 ton.	1	EA.	$8,000.00	$8,000.00						
System 13	Packaged rooftop single zone - 8 ton.	1	EA.	$8,000.00	$8,000.00						
System 14	Packaged rooftop single zone - 6 ton.	1	EA.	$6,500.00	$6,500.00						
System 15	Packaged rooftop single zone - 24 ton.	1	EA.	$23,000.00	$23,000.00						
Lighting:	None					None					
TOTALS =					**$617,020.00**					**$939,148.00**	**$322,128.00**

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Large Office - Chadron Nebraska - 18% WWR** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
General:											
Exterior Wall System	R13 fiberglass batt insulation in 4-inch mtl. studs plus R3.8 continuous rigid insulation.	21,600	S.F.	$3.50	$75,600.00	R13 fiberglass batt insulation in 4-inch mtl. Studs plus R3.8 continuous rigid insulation.	21,600	S.F.	$3.50	$75,600.00	$0.00
Exterior Roof System	R20 (above deck) polyisocyanurate insulation.	20,000	S.F.	$2.29	$45,800.00	R30 (above deck) polyisocyanurate insulation.	20,000	S.F.	$2.85	$57,000.00	$11,200.00
Exterior Windows	Interior clear glass; No thermal frames.	8,208	S.F.	$41.00	$336,528.00	PPG-Solarban (70XL (2) Starphire) insulated glass w/ thermally-broken aluminum frames.	8,208	S.F.	$56.00	$459,648.00	$123,120.00
H.V.A.C.											
System 1	Packaged rooftop single zone - 7 ton.	1	EA.	$8,000.00	$8,000.00	Packaged V.A.V. with electrical reheat system fans with V.S.D. - 34 ton.	1	EA.	$69,000.00	$69,000.00	$61,000.00
						V.A.V. Boxes - 2,589 CFM.	1	EA.	$2,600.00	$2,600.00	$2,600.00
						V.A.V. Boxes - 1,182 CFM.	1	EA.	$1,200.00	$1,200.00	$1,200.00
						V.A.V. Boxes - 1,803 CFM.	1	EA.	$1,800.00	$1,800.00	$1,800.00

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Large Office - Chadron Nebraska - 18% WWR** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
						V.A.V. Boxes - 1,300 CFM.	1	EA.	$1,300.00	$1,300.00	$1,300.00
						V.A.V. Boxes - 3,800 CFM.	2	EA.	$3,800.00	$7,600.00	$7,600.00
System 2	Packaged rooftop single zone- 3 ton.	1	EA.	$3,000.00	$3,000.00	Packaged V.A.V. with electrical reheat system fans with V.S.D. - 37 ton.	1	EA.	$82,500.00	$82,500.00	$79,500.00
						V.A.V. Boxes - 3,113 CFM.	1	EA.	$3,100.00	$3,100.00	$3,100.00
						V.A.V. Boxes - 1,385 CFM.	1	EA.	$1,400.00	$1,400.00	$1,400.00
						V.A.V. Boxes - 2,133 CFM.	1	EA.	$2,200.00	$2,200.00	$2,200.00
						V.A.V. Boxes - 1,483 CFM.	1	EA.	$1,500.00	$1,500.00	$1,500.00
						V.A.V. Boxes - 3,100 CFM.	2	EA.	$3,100.00	$6,200.00	$6,200.00
System 3	Packaged rooftop single zone - 5 ton.	1	EA.	$5,000.00	$5,000.00	Packaged V.A.V. with electrical reheat system fans with V.S.D. - 40 ton.	1	EA.	$89,500.00	$89,500.00	$84,500.00
						V.A.V. Boxes - 3,113 CFM.	1	EA.	$3,100.00	$3,100.00	$3,100.00
						V.A.V. Boxes - 1,385 CFM.	1	EA.	$1,400.00	$1,400.00	$1,400.00
						V.A.V. Boxes - 2,133 CFM.	1	EA.	$2,200.00	$2,200.00	$2,200.00

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Large Office - Chadron Nebraska - 18% WWR** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
						V.A.V. Boxes - 1,483 CFM.	1	EA.	$1,500.00	$1,500.00	$1,500.00
						V.A.V. Boxes - 3,800 CFM.	2	EA.	$3,800.00	$7,600.00	$7,600.00
System 4	Packaged rooftop single zone - 4 ton.	1	EA.	$4,500.00	$4,500.00						
System 5	Packaged rooftop single zone - 17 ton.	1	EA.	$17,000.00	$17,000.00						
System 6	Packaged rooftop single zone - 8 ton.	1	EA.	$8,500.00	$8,500.00						
System 7	Packaged rooftop single zone - 4 ton.	1	EA.	$4,500.00	$4,500.00						
System 8	Packaged rooftop single zone - 5 ton.	1	EA.	$5,000.00	$5,000.00						
System 9	Packaged rooftop single zone - 4 ton.	1	EA.	$4,500.00	$4,500.00						
System 10	Packaged rooftop single zone - 17 ton.	1	EA.	$17,000.00	$17,000.00						
System 11	Packaged rooftop single zone - 9 ton.	1	EA.	$9,000.00	$9,000.00						
System 12	Packaged rooftop single zone - 4 ton.	1	EA.	$4,500.00	$4,500.00						

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Large Office - Chadron Nebraska - 18% WWR** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
System 13	Packaged rooftop single zone - 6 ton.	1	EA.	$6,500.00	$6,500.00						
System 14	Packaged rooftop single zone - 4 ton.	1	EA.	$4,500.00	$4,500.00						
System 15	Packaged rooftop single zone - 21 ton.	1	EA.	$20,000.00	$20,000.00						
Lighting:	None					None					
TOTALS =					**$579,428.00**					**$877,948.00**	**$298,520.00**

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Large Office - Norfolk, Nebraska - 18% WWR** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
General:											
Exterior Wall System	R13 fiberglass batt insulation in 4-inch mtl. studs plus R3.8 continuous rigid insulation.	21,600	S.F.	$3.50	$75,600.00	R13 fiberglass batt insulation in 4-inch mtl. Studs plus R3.8 continuous rigid insulation.	21,600	S.F.	$3.50	$75,600.00	$0.00
Exterior Roof System	R20 (above deck) polyisocyanurate insulation.	20,000	S.F.	$2.29	$45,800.00	R30 (above deck) polyisocyanurate insulation.	20,000	S.F.	$2.85	$57,000.00	$11,200.00
Exterior Windows	Interior clear glass; No thermal frames.	8,208	S.F.	$41.00	$336,528.00	PPG-Solarban (70XL (2) Starphire) insulated glass w/ thermally-broken aluminum frames.	8,208	S.F.	$56.00	$459,648.00	$123,120.00
H.V.A.C.											
System 1	Packaged rooftop single zone - 7 ton.	1	EA.	$8,000.00	$8,000.00	Packaged V.A.V. with electrical reheat system fans with V.S.D. - 41 ton.	1	EA.	$83,500.00	$83,500.00	$75,500.00
						V.A.V. Boxes - 2,355 CFM.	1	EA.	$2,300.00	$2,300.00	$2,300.00
						V.A.V. Boxes - 1,182 CFM.	1	EA.	$1,200.00	$1,200.00	$1,200.00
						V.A.V. Boxes - 1,762 CFM.	1	EA.	$1,700.00	$1,700.00	$1,700.00

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Large Office - Norfolk, Nebraska - 18% WWR** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
						V.A.V. Boxes - 1,154 CFM.	1	EA.	$1,100.00	$1,100.00	$1,100.00
						V.A.V. Boxes - 3,600 CFM.	2	EA.	$3,600.00	$7,200.00	$7,200.00
System 2	Packaged rooftop single zone- 4 ton.	1	EA.	$4,500.00	$4,500.00	Packaged V.A.V. with electrical reheat system fans with V.S.D. - 44 ton.	1	EA.	$93,500.00	$93,500.00	$89,000.00
						V.A.V. Boxes - 2,806 CFM.	1	EA.	$2,600.00	$2,600.00	$2,600.00
						V.A.V. Boxes - 1,357 CFM.	1	EA.	$1,400.00	$1,400.00	$1,400.00
						V.A.V. Boxes - 2,015 CFM.	1	EA.	$1,900.00	$1,900.00	$1,900.00
						V.A.V. Boxes - 1,292 CFM.	1	EA.	$1,300.00	$1,300.00	$1,300.00
						V.A.V. Boxes - 3,600 CFM.	2	EA.	$4,300.00	$8,600.00	$8,600.00
System 3	Packaged rooftop single zone - 6 ton.	1	EA.	$6,500.00	$6,500.00	Packaged V.A.V. with electrical reheat system fans with V.S.D. - 46 ton.	1	EA.	$103,500.00	$103,500.00	$97,000.00
						V.A.V. Boxes - 2,806 CFM.	1	EA.	$2,600.00	$2,600.00	$2,600.00
						V.A.V. Boxes - 1,357 CFM.	1	EA.	$1,400.00	$1,400.00	$1,400.00
						V.A.V. Boxes - 2,015 CFM.	1	EA.	$1,900.00	$1,900.00	$1,900.00

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Large Office - Norfolk, Nebraska - 18% WWR** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
						V.A.V. Boxes - 1,292 CFM.	1	EA.	$1,300.00	$1,300.00	$1,300.00
						V.A.V. Boxes - 3,600 CFM.	2	EA.	$3,600.00	$7,200.00	$7,200.00
System 4	Packaged rooftop single zone - 4 ton.	1	EA.	$4,500.00	$4,500.00						
System 5	Packaged rooftop single zone - 20 ton.	1	EA.	$19,000.00	$19,000.00						
System 6	Packaged rooftop single zone - 9 ton.	1	EA.	$9,000.00	$9,000.00						
System 7	Packaged rooftop single zone - 4 ton.	1	EA.	$4,500.00	$4,500.00						
System 8	Packaged rooftop single zone - 6 ton.	1	EA.	$6,500.00	$6,500.00						
System 9	Packaged rooftop single zone - 4 ton.	1	EA.	$4,500.00	$4,500.00						
System 10	Packaged rooftop single zone - 20 ton.	1	EA.	$19,000.00	$19,000.00						
System 11	Packaged rooftop single zone - 10 ton.	1	EA.	$10,000.00	$10,000.00						

Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Large Office - Norfolk, Nebraska - 18% WWR** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
System 12	Packaged rooftop single zone - 5 ton.	1	EA.	$5,000.00	$5,000.00						
System 13	Packaged rooftop single zone - 7 ton.	1	EA.	$8,000.00	$8,000.00						
System 14	Packaged rooftop single zone - 4 ton.	1	EA.	$4,500.00	$4,500.00						
System 15	Packaged rooftop single zone - 23 ton.	1	EA.	$21,000.00	$21,000.00						
Lighting:	None					None					
TOTALS =					**$592,428.00**					**$916,448.00**	**$324,020.00**

Nebraska-specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Large Office - Omaha, Nebraska - 18% WWR** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
General:											
Exterior Wall System	R13 fiberglass batt insulation in 4-inch mtl. studs without continuous rigid insulation.	21,600	S.F.	$2.62	$56,592.00	R13 fiberglass batt insulation in 4-inch mtl. Studs plus R3.8 continuous rigid insulation.	21,600	S.F.	$3.50	$75,600.00	$19,008.00
Exterior Roof System	R20 (above deck) polyisocyanurate insulation.	20,000	S.F.	$2.29	$45,800.00	R30 (above deck) polyisocyanurate insulation.	20,000	S.F.	$2.85	$57,000.00	$11,200.00
Exterior Windows	Interior clear glass; No thermal frames.	3,888	S.F.	$41.00	$159,408.00	PPG-Solarban (70XL (2) Starphire) insulated glass w/ thermally-broken aluminum frames.	3,888	S.F.	$56.00	$217,728.00	$58,320.00
H.V.A.C.											
System 1	Packaged rooftop single zone - 8 ton.	1	EA.	$8,500.00	$8,500.00	Packaged V.A.V. with electrical reheat system fans with V.S.D. - 44 ton.	1	EA.	$89,500.00	$89,500.00	$81,000.00
						V.A.V. Boxes - 2,332 CFM.	1	EA.	$2,300.00	$2,300.00	$2,300.00
						V.A.V. Boxes - 1,116 CFM.	1	EA.	$1,100.00	$1,100.00	$1,100.00
						V.A.V. Boxes - 1,739 CFM.	1	EA.	$1,700.00	$1,700.00	$1,700.00

Nebraska-specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Large Office - Omaha, Nebraska - 18% WWR** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
						V.A.V. Boxes - 1,159 CFM.	1	EA.	$1,100.00	$1,100.00	$1,100.00
						V.A.V. Boxes - 3,500 CFM.	2	EA.	$3,500.00	$7,000.00	$7,000.00
System 2	Packaged rooftop single zone- 4 ton.	1	EA.	$4,500.00	$4,500.00	Packaged V.A.V. with electrical reheat system fans with V.S.D. - 47 ton.	1	EA.	$94,500.00	$94,500.00	$90,000.00
						V.A.V. Boxes - 2,777 CFM.	1	EA.	$2,800.00	$2,800.00	$2,800.00
						V.A.V. Boxes - 1,302 CFM.	1	EA.	$1,300.00	$1,300.00	$1,300.00
						V.A.V. Boxes - 2,005 CFM.	1	EA.	$2,000.00	$2,000.00	$2,000.00
						V.A.V. Boxes - 1,283 CFM.	1	EA.	$1,300.00	$1,300.00	$1,300.00
						V.A.V. Boxes - 3,500 CFM.	2	EA.	$3,500.00	$7,000.00	$7,000.00
System 3	Packaged rooftop single zone - 6 ton.	1	EA.	$6,500.00	$6,500.00	Packaged V.A.V. with electrical reheat system fans with V.S.D. - 49 ton.	1	EA.	$98,500.00	$98,500.00	$92,000.00
						V.A.V. Boxes - 2,777 CFM.	1	EA.	$2,800.00	$2,800.00	$2,800.00
						V.A.V. Boxes - 1,302 CFM.	1	EA.	$1,300.00	$1,300.00	$1,300.00
						V.A.V. Boxes - 2,005 CFM.	1	EA.	$2,000.00	$2,000.00	$2,000.00

Nebraska-specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Large Office - Omaha, Nebraska - 18% WWR** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
						V.A.V. Boxes - 1,283 CFM.	1	EA.	$1,300.00	$1,300.00	$1,300.00
						V.A.V. Boxes - 3,500 CFM.	2	EA.	$3,500.00	$7,000.00	$7,000.00
System 4	Packaged rooftop single zone - 4 ton.	1	EA.	$4,500.00	$4,500.00						
System 5	Packaged rooftop single zone - 22 ton.	1	EA.	$21,000.00	$21,000.00						
System 6	Packaged rooftop single zone - 9 ton.	1	EA.	$9,000.00	$9,000.00						
System 7	Packaged rooftop single zone - 4 ton.	1	EA.	$4,500.00	$4,500.00						
System 8	Packaged rooftop single zone - 7 ton.	1	EA.	$8,000.00	$8,000.00						
System 9	Packaged rooftop single zone - 4 ton.	1	EA.	$4,500.00	$4,500.00						
System 10	Packaged rooftop single zone - 22 ton.	1	EA.	$21,000.00	$21,000.00						
System 11	Packaged rooftop single zone - 10 ton.	1	EA.	$10,000.00	$10,000.00						

Nebraska-specific Advanced Commercial Building Energy Code Study

September 2, 2009 BCC Project # 09-08-0120

Building Type: **Large Office - Omaha, Nebraska - 18% WWR** Back to Summary

DESCRIPTION	2003 IECC BASELINE BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ALTERNATIVE (PROPOSED) BUILDING	QTY	UNIT	COST / UNIT	TOTAL	ADDED (DELTA) COST TOTAL
System 12	Packaged rooftop single zone - 5 ton.	1	EA.	$5,000.00	$5,000.00						
System 13	Packaged rooftop single zone - 7 ton.	1	EA.	$8,000.00	$8,000.00						
System 14	Packaged rooftop single zone - 5 ton.	1	EA.	$5,000.00	$5,000.00						
System 15	Packaged rooftop single zone - 25 ton.	1	EA.	$24,000.00	$24,000.00						
Lighting:	None					None					
TOTALS =					**$405,800.00**					**$674,828.00**	**$269,028.00**

Preventative (Recurring) and Non-Recurring Maintenance Costs (2009)

11 September 2009

LEO A DALY

Equipment	Replacement/ Maintenance Frequency	Approx. Parts Cost	Approx. Labor Hours	Approx. Labor Cost	OMAHA Replacement Cost (Each Occurrence)	NORFOLK Replacement Cost (Each Occurrence)	CHADRON Replacement Cost (Each Occurrence)	Times Cost Incurred During 20 Year LCCA	Notes
	[years]	[$]	[hours]	[$]	See Note (b)	See Note (b)	See Note (b)		
General Preventative Maintenance									See Note (a)
Packaged Single Zone AC & Heat Pump Units									
1 to 5 Ton	1	900		$ -	$ 900.00	$ 857.70	$ 791.10	19	
7.5-20 Ton	1	1200		$ -	$ 1,200.00	$ 1,143.60	$ 1,054.80	19	
25-30 Ton	1	1500		$ -	$ 1,500.00	$ 1,429.50	$ 1,318.50	19	
35-40 Ton	1	1800		$ -	$ 1,800.00	$ 1,715.40	$ 1,582.20	19	
45-60 Ton	1	2400		$ -	$ 2,400.00	$ 2,287.20	$ 2,109.60	19	
65-95 Ton	1	3300		$ -	$ 3,300.00	$ 3,144.90	$ 2,900.70	19	
100-125 Ton	1	4600		$ -	$ 4,600.00	$ 4,383.80	$ 4,043.40	19	
DX Split System									
Quarterly maintenance	0.25		4	$ 229.68	$ 229.68	$ 218.89	$ 201.89	79	
Complete System Replacement									
DX Split System (up to 5 tons)									
High Efficiency Units					$ 3,500.00	$ 3,335.50	$ 3,076.50		Refer to BCC Estimates
CEE / Energy Star Compliant	12	3500						1	
Std. Efficiency Units					$ 2,600.00	$ 2,477.80	$ 2,285.40		Refer to BCC Estimates
ASHRAE Std. Compliant	12	2600						1	
Gas-Fired Furnace (Up to 5 tons)									
High Efficiency Units					$ 2,500.00	$ 2,382.50	$ 2,197.50		Refer to BCC Estimates
>90% AFUE	16	2500						1	
Std. Efficiency Units					$ 1,900.00	$ 1,810.70	$ 1,670.10		Refer to BCC Estimates
80% AFUE	16	1900						1	
Single-Packaged Rooftop A/C Units									
5 Tons and Smaller	12							1	Refer to BCC Estimates
6 to 15 tons	15							1	Refer to BCC Estimates
16 to 20 tons	18							1	Refer to BCC Estimates
>20 tons	20							0	Refer to BCC Estimates
Compressor Replacements ***(assume Rotary)***									
Packaged Single Zone AC & Heat Pump Units									
5 Tons and Smaller Units	***Assume NO compressor replacements (for systems in this tonnage range) during the life of the Unit; rather only replace as entire unit every 12 Year***								
6 to 10 Ton Units (2 @ 5 TR each)	10	6,000.00	8	$ 459.36	$ 8,720.14	$ 8,310.29	$ 7,665.00	1	**+ Replace Unit - Yr. 15**
11 to 15 Ton Units (3 @ 5 TR each)	10	9,000.00	11.5	$ 660.33	$ 13,041.45	$ 12,428.50	$ 11,463.43	1	**+ Replace Unit - Yr. 15**
16 to 20 Ton Units (2 @ 10 TR each)	10	10,000.00	12	$ 689.04	$ 14,430.20	$ 13,751.98	$ 12,684.15	1	**+ Replace Unit - Yr. 18**
21 to 25 Ton Units (2 @ 10 TR + 5TR)	10	13,000.00	16	$ 918.72	$ 18,790.27	$ 17,907.13	$ 16,516.65	1	
26 to 30 Ton Units (2 @ 15 TR each)	10	15,000.00	14	$ 803.88	$ 21,335.24	$ 20,332.48	$ 18,753.67	1	
31 to 35 Ton Units (3 @ 10 TR+ 5TR)	10	18,000.00	22	$ 1,263.24	$ 26,005.37	$ 24,783.12	$ 22,858.72	1	
36 to 40 Ton Units (4 @ 10 TR each)	10	20,000.00	24.5	$ 1,406.79	$ 28,899.17	$ 27,540.91	$ 25,402.37	1	
41 to 45 Ton Units (3 @ 15 TR each)	10	22,500.00	21	$ 1,205.82	$ 32,002.86	$ 30,498.72	$ 28,130.51	1	
46 to 50 Ton Units (3 @ 15 TR +5 TR)	10	25,000.00	25	$ 1,435.50	$ 35,687.93	$ 34,010.59	$ 31,369.69	1	
Boilers (Hot Water) *(each)*									
Replace Flame Retention Rods	1	200.00	3	$ 143.55	$ 343.55	$ 327.40	$ 301.98	19	
Re-Calibration	1	-	3	$ 143.55	$ 143.55	$ 136.80	$ 126.18	19	
General Maintenance	1	200.00	3	$ 143.55	$ 343.55	$ 327.40	$ 301.98	19	
Chemical Treatment	1	200.00	3	$ 143.55	$ 343.55	$ 327.40	$ 301.98	19	
VFD *(each)*									
General Maintenance	0.5		4	$ 229.68	$ 229.68	$ 218.89	$ 201.89	39	
DC Fan	5	25.00	1	$ 71.78	$ 96.78	$ 92.23	$ 85.07	3	
Replace VFD									
(2009 RS Means - Electrical)									
5 Hp	15	2,080.00	4	$ 203.96	$ 2,283.96	$ 2,176.61	$ 2,007.60	1	(same mdl./in-kind)
7.5 - 10 Hp	15	2,490.00	5	$ 254.95	$ 2,744.95	$ 2,615.94	$ 2,412.81	1	(same mdl./in-kind)
15 Hp	15	2,980.00	8	$ 407.92	$ 3,387.92	$ 3,228.69	$ 2,977.98	1	(same mdl./in-kind)
20 Hp	15	4,205.00	8	$ 407.92	$ 4,612.92	$ 4,396.11	$ 4,054.76	1	(same mdl./in-kind)
25 Hp	15	4,975.00	10	$ 509.90	$ 5,484.90	$ 5,227.11	$ 4,821.23	1	(same mdl./in-kind)
30 Hp	15	5,925.00	10	$ 509.90	$ 6,434.90	$ 6,132.46	$ 5,656.28	1	(same mdl./in-kind)
40 Hp	15	8,450.00	10	$ 509.90	$ 8,959.90	$ 8,538.78	$ 7,875.75	1	(same mdl./in-kind)

Preventative (Recurring) and Non-Recurring Maintenance Costs (2009)

11 September 2009

LEO A DALY

Equipment	Replacement/ Maintenance Frequency	Approx. Parts Cost	Approx. Labor Hours	Approx. Labor Cost	OMAHA Replacement Cost (Each Occurrence)	NORFOLK Replacement Cost (Each Occurrence)	CHADRON Replacement Cost (Each Occurrence)	Times Cost Incurred During 20 Year LCCA	Notes
	[years]	[$]	[hours]	[$]	See Note (b)	See Note (b)	See Note (b)		
50 Hp	15	9,275.00	15	$ 764.85	$ 10,039.85	$ 9,567.98	$ 8,825.03	1	(same mdl./in-kind)
ERV									
General Maintenance	0.25	-	4	$ 229.68	$ 229.68	$ 218.89	$ 201.89	79	
Motor Replacement (20 hp)	10	2,000.00	2	$ 114.84	$ 2,114.84	$ 2,015.44	$ 1,858.94	1	Linear progression in cost
Motor Replacement (3 hp)	10	250.00	2	$ 114.84	$ 364.84	$ 347.69	$ 320.69	1	b/w 3 and 20 hp motors
Pumps									
General Maintenance	0.25	-	6	$ 344.52	$ 344.52	$ 328.33	$ 302.83	79	
Fans									
1 to 5 Ton Refrigeration Units									
Belts	1	50.00		$ -	$ 50.00	$ 47.65	$ 43.95	19	1 set each
Evap fan motor	8	300.00		$ -	$ 300.00	$ 285.90	$ 263.70	2	1 each
(1 each) Cond fan motor	8	200.00		$ -	$ 200.00	$ 190.60	$ 175.80	2	1 set each
7.5-20 Ton Refrigeration Units									
Belts	1	75.00		$ -	$ 75.00	$ 71.48	$ 65.93	19	1 set each
Evap fan motor	8	400.00		$ -	$ 400.00	$ 381.20	$ 351.60	2	1 each
(2 each) Cond fan motor	8	500.00		$ -	$ 500.00	$ 476.50	$ 439.50	2	1 set each
25-30 Ton Refrigeration Units									
Belts	1	100.00		$ -	$ 100.00	$ 95.30	$ 87.90	19	1 set each
Evap fan motor	8	900.00		$ -	$ 900.00	$ 857.70	$ 791.10	2	1 each
(3 each) Cond fan motor	8	1,200.00		$ -	$ 1,200.00	$ 1,143.60	$ 1,054.80	2	1 set each
35-40 Ton Refrigeration Units									
Belts	1	150.00		$ -	$ 150.00	$ 142.95	$ 131.85	19	1 set each
Evap fan motor	8	1,300.00		$ -	$ 1,300.00	$ 1,238.90	$ 1,142.70	2	1 each
(4 each) Cond fan motor	8	1,800.00		$ -	$ 1,800.00	$ 1,715.40	$ 1,582.20	2	1 set each
45-60 Ton Refrigeration Units									
Belts	1	200.00		$ -	$ 200.00	$ 190.60	$ 175.80	19	1 set each
Evap fan motor	8	1,600.00		$ -	$ 1,600.00	$ 1,524.80	$ 1,406.40	2	1 each
(6 each) Cond fan motor	8	3,000.00		$ -	$ 3,000.00	$ 2,859.00	$ 2,637.00	2	1 set each
65-95 Ton Refrigeration Units									
Belts	1	250.00		$ -	$ 250.00	$ 238.25	$ 219.75	19	1 set each
Evap fan motor	8	1,900.00		$ -	$ 1,900.00	$ 1,810.70	$ 1,670.10	2	1 each
(8 each) Cond fan motor	8	4,400.00		$ -	$ 4,400.00	$ 4,193.20	$ 3,867.60	2	1 set each
100-125 Ton Refrigeration Units									
Belts	1	300.00		$ -	$ 300.00	$ 285.90	$ 263.70	19	1 set each
Evap fan motor	8	2,200.00		$ -	$ 2,200.00	$ 2,096.60	$ 1,933.80	2	1 each
(12 each) Cond fan motor	8	7,200.00		$ -	$ 7,200.00	$ 6,861.60	$ 6,328.80	2	1 set each
Split System (Furnace Evap. Fan)									
Fan motor	8	300.00		$ -	$ 300.00	$ 285.90	$ 263.70	2	1 each
Controls/ Sensors									
Various components	10	200.00		$ -	$ 200.00	$ 190.60	$ 175.80	1	
Fluid flow sensor *(boilers only)*	5	100.00		$ -	$ 100.00	$ 95.30	$ 87.90	3	
Airflow sensors	10	50.00		$ -	$ 50.00	$ 47.65	$ 43.95	1	
Pressure sensor	15	1,300.00		$ -	$ 1,300.00	$ 1,238.90	$ 1,142.70	1	
VAV Terminal Units									
Single duct									
No regular items				$ -	$ -				
Parallel Fan-Powered									
Terminal fan	10	200.00		$ -	$ 200.00	$ 190.60	$ 175.80	1	
Lighting *(per 1,000 SF Area)*									
Fluorescent Lamp Replacements (ave. life @ 12 hrs/day ave. use)									
(25,000 hours) T8 Lamps	6								
0.8 W/SF Density					$107.20	$ 102.16	$ 94.23		(per 1,000 SF Area)
0.92 to 1.0 W/SF Density					$128.64	$ 122.59	$ 113.07		(per 1,000 SF Area)
1.5 W/SF Density					$214.40	$ 204.32	$ 188.46		(per 1,000 SF Area)

Preventative (Recurring) and Non-Recurring Maintenance Costs (2009)

11 September 2009

LEO A DALY

Equipment	Replacement/ Maintenance Frequency	Approx. Parts Cost	Approx. Labor Hours	Approx. Labor Cost	OMAHA Replacement Cost (Each Occurrence)	NORFOLK Replacement Cost (Each Occurrence)	CHADRON Replacement Cost (Each Occurrence)	Times Cost Incurred During 20 Year LCCA	Notes
	[years]	[$]	[hours]	[$]	See Note (b)	See Note (b)	See Note (b)		
1.89 W/SF Density					$257.28	$ 245.19	$ 226.15		(per 1,000 SF Area)
2.1 W/SF Density					$300.16	$ 286.05	$ 263.84		(per 1,000 SF Area)
(20,000 hours) T5 Lamps	5								
0.8 W/SF Density					$154.40	$ 147.14	$ 135.72		(per 1,000 SF Area)
0.92 to 1.0 W/SF Density					$185.28	$ 176.57	$ 162.86		(per 1,000 SF Area)
1.5 W/SF Density					$308.80	$ 294.29	$ 271.44		(per 1,000 SF Area)
1.89 W/SF Density					$370.56	$ 353.14	$ 325.72		(per 1,000 SF Area)
2.1 W/SF Density					$432.32	$ 412.00	$ 380.01		(per 1,000 SF Area)
Electronic Ballast Replacements 50,000 hours (ave. life) @ 12 hrs/d	12								
0.8 W/SF Density					$1,585.00	$ 1,510.51	$ 1,393.22		(per 1,000 SF Area)
0.92 to 1.0 W/SF Density					$1,902.00	$ 1,812.61	$ 1,671.86		(per 1,000 SF Area)
1.5 W/SF Density					$3,170.00	$ 3,021.01	$ 2,786.43		(per 1,000 SF Area)
1.89 W/SF Density					$3,804.00	$ 3,625.21	$ 3,343.72		(per 1,000 SF Area)
2.1 W/SF Density					$4,438.00	$ 4,229.41	$ 3,901.00		(per 1,000 SF Area)

General Parameters & Assumptions

Life Cycle Period [years]		20		
Labor Rate (HVAC Tech)	(Note b)	$ 57.42	(Omaha)	Source: The Whitestone Building Maintenance and Repair Cost Reference 2008-2009; pg. 18(
Labor Rate (Electrician)	(Note b)	$ 50.99	(Omaha)	Source: The Whitestone Building Maintenance and Repair Cost Reference 2008-2009; pg. 18(

Notes:

(a) Including periodic inspection, lubrication, burner/condenser coil cleaning maintenance.
Filter replacement cost is excluded, as same is considered roughly similar for all system (alternative) types based on a presumption of comparable total airflow

(b) Local Area Maintenance Labor Cost Index Adjustment Factors related to labor are as follows with adjustments from nearest city published data

Omaha, NE	(adjusted to be 'baseline')	100%
Norfolk, NE	(adjusted from Rapid City, SD)	**95.30%**
Chadron, NE	(adjusted from Sioux City, IA)	**87.90%**

(x) Initial data compiled from various sources: ASHRAE, Whitestone Research, State of Iowa DNR, and Omaha HVAC equipment manufacturer representatives, with adjustments based on LEO A DALY experience (where deemed appropriate).

(z) Including Material & Labor Costs (Omaha, NE)

Major Equipment Average Sericeable Life (Note x)	(Years)
Packaged SZ Rooftop A/C & Heat Pump Units	
Under 5 tons	**12**
5 to 15 tons	**15**
16 to 20 tons	**18**
>20 tons	**20**
Gas Furnaces	**16**
DX Split System Condensing Units	**12**
Variable Frequency Drives	**15**
Total Energy Wheel-based Heat Recovery Units	**25**
Circulating Pumps	**25**
Gas-fired Hot Water Boilers	**30 +/-**
VAV Air-Handling Units	**25**
VAV Terminal Units (all types)	**25**
Electric Motors (for RTAC equip. & condensing units)	**8**
Electric Motors (indoor HVAC fan/pump equipment)	**22 +/-**
Refrigeration Compressors *(except as noted)*	**10 +/-**

Fluorescent Lighting Systems - 2009 Replacement Costs (per 1000 SF

Watts/SF Density	Ave. 4-lamp Fixture Qty.	Re-Lamp T8 *(Note (z)*	Re-Lamp T5 *(Note (z)*	Replace Ballasts
0.8	5	$107.20	$154.40	$1,585.00
0.92 to 1.0	6	$128.64	$185.28	$1,902.00
1.5	10	$214.40	$308.80	$3,170.00
1.89	12	$257.28	$370.56	$3,804.00
2.1	14	$300.16	$432.32	$4,438.00

Cost/Fixture	Qty.	Material	Labor (Omaha)	Total/Fixture
T8 Lamps	4 each	$9.44	$12.00	$21.44
T5 Lamps	4 each	$18.88	$12.00	$30.88
Ballasts (*)	2 each	$160.00	$157.00	$317.00

(*) Assumes Premium Efficiency Electronic Dimming (2-Lamp) Ballasts

NIST BLCC 5.3-09: Comparative Analysis

Consistent with Federal Life Cycle Cost Methodology and Procedures, 10 CFR, Part 436, Subpart A

Base Case: 2003 IECC Base Case

Alternative: 30% Alternative Design

General Information

File Name:	C:\Program Files (x86)\BLCC5\projects\Completed\Large Office 38WWR Omaha Residual Value.xml
Date of Study:	Thu Oct 01 16:33:47 CDT 2009
Project Name:	Large Office 38% WWR - Omaha
Project Location:	Nebraska
Analysis Type:	FEMP Analysis, Energy Project
Analyst:	SM Cherney
Base Date:	October 1, 2009
Service Date:	October 1, 2009
Study Period:	20 years 0 months(October 1, 2009 through September 30, 2029
Discount Rate:	3%
Discounting Convention:	End-of-Year

Comparison of Present-Value Costs

PV Life-Cycle Cost

	Base Case	Alternative	Savings from Alternative
Initial Investment Costs:			
Capital Requirements as of Base Date	$617,020	$939,148	-$322,128
Future Costs:			
Energy Consumption Costs	$756,782	$663,630	$93,152
Energy Demand Charges	$0	$0	$0
Energy Utility Rebates	$0	$0	$0
Water Costs	$0	$0	$0
Recurring and Non-Recurring OM&R Costs	$709,111	$491,658	$217,453
Capital Replacements	$160,000	$0	$160,000
Residual Value at End of Study Period	-$288,906	-$281,744	-$7,162
Subtotal (for Future Cost Items)	$1,336,988	$873,544	$463,443
Total PV Life-Cycle Cost	$1,954,008	$1,812,692	$141,315

Net Savings from Alternative Compared with Base Case

PV of Non-Investment Savings	$310,605
- Increased Total Investment	$169,290
Net Savings	$141,315

Savings-to-Investment Ratio (SIR)

SIR = 1.83

Adjusted Internal Rate of Return

AIRR 6.17%

AIRR = 6.17%

Payback Period

Estimated Years to Payback (from beginning of Service Period)

Simple Payback occurs in year	14
Discounted Payback occurs in year	16

Energy Savings Summary

Energy Savings Summary (in stated units)

Energy Type	Average Annual Consumption Base Case	Alternative	Savings	Life-Cycle Savings
Electricity	654,545.0 kWh	608,474.0 kWh	46,071.0 kWh	921,293.9 kWh
Natural Gas	7,008.0 Therm	0.0 Therm	7,008.0 Therm	140,140.8 Therm

Energy Savings Summary (in MBtu)

Energy Type	Average Annual Consumption Base Case	Alternative	Savings	Life-Cycle Savings
Electricity	2,233.4 MBtu	2,076.2 MBtu	157.2 MBtu	3,143.6 MBtu
Natural Gas	700.8 MBtu	0.0 MBtu	700.8 MBtu	14,014.1 MBtu

Emissions Reduction Summary

Energy Type	Average Annual Emissions Base Case	Alternative	Reduction	Life-Cycle Reduction
Electricity				
CO2	685,137.71 kg	636,913.40 kg	48,224.31 kg	964,354.12 kg
SO2	1,268.86 kg	1,179.55 kg	89.31 kg	1,785.96 kg
NOx	1,381.02 kg	1,283.81 kg	97.20 kg	1,943.83 kg
Natural Gas				
CO2	37,018.74 kg	0.00 kg	37,018.74 kg	740,273.36 kg
SO2	298.75 kg	0.00 kg	298.75 kg	5,974.24 kg
NOx	28.84 kg	0.00 kg	28.84 kg	576.72 kg
Total:				
CO2	722,156.44 kg	636,913.40 kg	85,243.04 kg	1,704,627.48 kg
SO2	1,567.61 kg	1,179.55 kg	388.06 kg	7,760.20 kg
NOx	1,409.86 kg	1,283.81 kg	126.04 kg	2,520.55 kg

NIST BLCC 5.3-09: Comparative Analysis

Consistent with Federal Life Cycle Cost Methodology and Procedures, 10 CFR, Part 436, Subpart A

Base Case: 2003 IECC Base Case

Alternative: 30% Alternative Design

General Information

File Name:	C:\Program Files (x86)\BLCC5\projects\Large Office 38WWR Norfolk Residual Value.xml
Date of Study:	Thu Oct 01 17:26:50 CDT 2009
Project Name:	Large Office 38% WWR - Norfolk
Project Location:	Nebraska
Analysis Type:	FEMP Analysis, Energy Project
Analyst:	SM Cherney
Base Date:	October 1, 2009
Service Date:	October 1, 2009
Study Period:	20 years 0 months(October 1, 2009 through September 30, 2029
Discount Rate:	3%
Discounting Convention:	End-of-Year

Comparison of Present-Value Costs

PV Life-Cycle Cost

	Base Case	Alternative	Savings from Alternative
Initial Investment Costs:			
Capital Requirements as of Base Date	$642,680	$939,148	-$296,468
Future Costs:			
Energy Consumption Costs	$789,950	$663,526	$126,424
Energy Demand Charges	$0	$0	$0
Energy Utility Rebates	$0	$0	$0
Water Costs	$0	$0	$0
Recurring and Non-Recurring OM&R Costs	$669,112	$469,324	$199,788
Capital Replacements	$152,480	$0	$152,480
Residual Value at End of Study Period	-$291,725	-$281,744	-$9,981
Subtotal (for Future Cost Items)	$1,319,817	$851,105	$468,712
Total PV Life-Cycle Cost	$1,962,497	$1,790,253	$172,244

Net Savings from Alternative Compared with Base Case

PV of Non-Investment Savings	$326,213
- Increased Total Investment	$153,969
Net Savings	$172,244

Savings-to-Investment Ratio (SIR)

SIR = 2.12

Adjusted Internal Rate of Return

AIRR = 6.94%

Payback Period

Estimated Years to Payback (from beginning of Service Period)

Simple Payback occurs in year	13
Discounted Payback occurs in year	16

Energy Savings Summary

Energy Savings Summary (in stated units)

Energy Type	Average Annual Consumption Base Case	Alternative	Savings	Life-Cycle Savings
Electricity	671,895.0 kWh	614,453.0 kWh	57,442.0 kWh	1,148,682.7 kWh
Natural Gas	6,899.0 Therm	0.0 Therm	6,899.0 Therm	137,961.1 Therm

Energy Savings Summary (in MBtu)

Energy Type	Average Annual Consumption Base Case	Alternative	Savings	Life-Cycle Savings
Electricity	2,292.6 MBtu	2,096.6 MBtu	196.0 MBtu	3,919.5 MBtu
Natural Gas	689.9 MBtu	0.0 MBtu	689.9 MBtu	13,796.2 MBtu

Emissions Reduction Summary

Energy Type	Average Annual Emissions Base Case	Alternative	Reduction	Life-Cycle Reduction
Electricity				
CO2	703,298.63 kg	643,171.85 kg	60,126.78 kg	1,202,370.89 kg
SO2	1,302.49 kg	1,191.14 kg	111.35 kg	2,226.76 kg
NOx	1,417.62 kg	1,296.43 kg	121.20 kg	2,423.59 kg
Natural Gas				
CO2	36,442.96 kg	0.00 kg	36,442.96 kg	728,759.40 kg
SO2	294.11 kg	0.00 kg	294.11 kg	5,881.32 kg
NOx	28.39 kg	0.00 kg	28.39 kg	567.75 kg
Total:				
CO2	739,741.59 kg	643,171.85 kg	96,569.73 kg	1,931,130.29 kg
SO2	1,596.60 kg	1,191.14 kg	405.46 kg	8,108.08 kg
NOx	1,446.02 kg	1,296.43 kg	149.59 kg	2,991.34 kg

NIST BLCC 5.3-09: Comparative Analysis

Consistent with Federal Life Cycle Cost Methodology and Procedures, 10 CFR, Part 436, Subpart A

Base Case: 2003 IECC Base Case

Alternative: 30% Alternative Design

General Information

File Name:	C:\Program Files (x86)\BLCC5\projects\Large Office 38WWR Chadron Residual Value.xml
Date of Study:	Fri Oct 02 08:22:49 CDT 2009
Project Name:	Large Office 38% WWR - Chadron
Project Location:	Nebraska
Analysis Type:	FEMP Analysis, Energy Project
Analyst:	SM Cherney
Base Date:	October 1, 2009
Service Date:	October 1, 2009
Study Period:	20 years 0 months(October 1, 2009 through September 30, 2029
Discount Rate:	3%
Discounting Convention:	End-of-Year

Comparison of Present-Value Costs

PV Life-Cycle Cost

	Base Case	Alternative	Savings from Alternative
Initial Investment Costs:			
Capital Requirements as of Base Date	$642,180	$934,548	-$292,368
Future Costs:			
Energy Consumption Costs	$726,995	$572,037	$154,958
Energy Demand Charges	$0	$0	$0
Energy Utility Rebates	$0	$0	$0
Water Costs	$0	$0	$0
Recurring and Non-Recurring OM&R Costs	$617,156	$432,168	$184,988
Capital Replacements	$140,640	$0	$140,640
Residual Value at End of Study Period	-$283,894	-$280,364	-$3,530
Subtotal (for Future Cost Items)	$1,200,897	$723,841	$477,056
Total PV Life-Cycle Cost	$1,843,077	$1,658,389	$184,688

Net Savings from Alternative Compared with Base Case

PV of Non-Investment Savings	$339,946
- Increased Total Investment	$155,258
Net Savings	$184,688

Savings-to-Investment Ratio (SIR)

SIR = 2.19

Adjusted Internal Rate of Return

AIRR = 7.12%

Payback Period

Estimated Years to Payback (from beginning of Service Period)

Simple Payback occurs in year	13
Discounted Payback occurs in year	15

Energy Savings Summary

Energy Savings Summary (in stated units)

Energy Type	Average Annual Consumption Base Case	Alternative	Savings	Life-Cycle Savings
Electricity	654,984.0 kWh	576,617.0 kWh	78,367.0 kWh	1,567,125.4 kWh
Natural Gas	3,734.0 Therm	0.0 Therm	3,734.0 Therm	74,669.8 Therm

Energy Savings Summary (in MBtu)

Energy Type	Average Annual Consumption Base Case	Alternative	Savings	Life-Cycle Savings
Electricity	2,234.9 MBtu	1,967.5 MBtu	267.4 MBtu	5,347.3 MBtu
Natural Gas	373.4 MBtu	0.0 MBtu	373.4 MBtu	7,467.0 MBtu

Emissions Reduction Summary

Energy Type	Average Annual Emissions Base Case	Alternative	Reduction	Life-Cycle Reduction
Electricity				
CO2	685,597.23 kg	603,567.44 kg	82,029.79 kg	1,640,371.15 kg
SO2	1,269.71 kg	1,117.79 kg	151.92 kg	3,037.93 kg
NOx	1,381.94 kg	1,216.60 kg	165.35 kg	3,306.46 kg
Natural Gas				
CO2	19,724.31 kg	0.00 kg	19,724.31 kg	394,432.18 kg
SO2	159.18 kg	0.00 kg	159.18 kg	3,183.19 kg
NOx	15.37 kg	0.00 kg	15.37 kg	307.29 kg
Total:				
CO2	705,321.53 kg	603,567.44 kg	101,754.10 kg	2,034,803.33 kg
SO2	1,428.89 kg	1,117.79 kg	311.10 kg	6,221.12 kg
NOx	1,397.31 kg	1,216.60 kg	180.71 kg	3,613.75 kg

NIST BLCC 5.3-09: Comparative Analysis

Consistent with Federal Life Cycle Cost Methodology and Procedures, 10 CFR, Part 436, Subpart A

Base Case: 2003 IECC Base Case

Alternative: 30% Alternative Design

General Information

File Name:	C:\Program Files (x86)\BLCC5\projects\Large Office 18WWR Omaha Residual Value.xml
Date of Study:	Fri Oct 02 15:29:46 CDT 2009
Project Name:	Large Office 18% WWR - Omaha
Project Location:	Nebraska
Analysis Type:	FEMP Analysis, Energy Project
Analyst:	A B Skillman
Base Date:	October 1, 2009
Service Date:	October 1, 2009
Study Period:	20 years 0 months(October 1, 2009 through September 30, 2029)
Discount Rate:	3%
Discounting Convention:	End-of-Year

Comparison of Present-Value Costs

PV Life-Cycle Cost

	Base Case	Alternative	Savings from Alternative
Initial Investment Costs:			
Capital Requirements as of Base Date	$405,800	$674,828	-$269,028
Future Costs:			
Energy Consumption Costs	$685,122	$566,936	$118,186
Energy Demand Charges	$0	$0	$0
Energy Utility Rebates	$0	$0	$0
Water Costs	$0	$0	$0
Recurring and Non-Recurring OM&R Costs	$570,356	$503,740	$66,616
Capital Replacements	$144,000	$0	$144,000
Residual Value at End of Study Period	-$208,700	-$202,448	-$6,252
Subtotal (for Future Cost Items)	$1,190,778	$868,227	$322,551
Total PV Life-Cycle Cost	$1,596,578	$1,543,055	$53,523

Net Savings from Alternative Compared with Base Case

PV of Non-Investment Savings	$184,802
- Increased Total Investment	$131,280
Net Savings	$53,523

Savings-to-Investment Ratio (SIR)

SIR = 1.41

Adjusted Internal Rate of Return

AIRR = 4.78%

Payback Period

Estimated Years to Payback (from beginning of Service Period)

Simple Payback occurs in year	16
Discounted Payback occurs in year	16

Energy Savings Summary

Energy Savings Summary (in stated units)

Energy Type	Average Annual Consumption Base Case	Alternative	Savings	Life-Cycle Savings
Electricity	595,022.0 kWh	523,513.0 kWh	71,509.0 kWh	1,429,984.2 kWh
Natural Gas	5,934.0 Therm	0.0 Therm	5,934.0 Therm	118,663.8 Therm

Energy Savings Summary (in MBtu)

Energy Type	Average Annual Consumption Base Case	Alternative	Savings	Life-Cycle Savings
Electricity	2,030.3 MBtu	1,786.3 MBtu	244.0 MBtu	4,879.3 MBtu
Natural Gas	593.4 MBtu	0.0 MBtu	593.4 MBtu	11,866.4 MBtu

Emissions Reduction Summary

Energy Type	Average Annual Emissions Base Case	Alternative	Reduction	Life-Cycle Reduction
Electricity				
CO2	622,832.67 kg	547,981.42 kg	74,851.25 kg	1,496,820.10 kg
SO2	1,153.47 kg	1,014.85 kg	138.62 kg	2,772.07 kg
NOx	1,255.43 kg	1,104.55 kg	150.88 kg	3,017.11 kg
Natural Gas				
CO2	31,345.49 kg	0.00 kg	31,345.49 kg	626,823.93 kg
SO2	252.97 kg	0.00 kg	252.97 kg	5,058.67 kg
NOx	24.42 kg	0.00 kg	24.42 kg	488.34 kg
Total:				
CO2	654,178.16 kg	547,981.42 kg	106,196.74 kg	2,123,644.03 kg
SO2	1,406.44 kg	1,014.85 kg	391.59 kg	7,830.74 kg
NOx	1,279.85 kg	1,104.55 kg	175.30 kg	3,505.44 kg

NIST BLCC 5.3-09: Comparative Analysis

Consistent with Federal Life Cycle Cost Methodology and Procedures, 10 CFR, Part 436, Subpart A

Base Case: 2003 IECC Base Case

Alternative: 30% Alternative Design

General Information

File Name:	C:\Program Files (x86)\BLCC5\projects\Large Office 18WWR Norfolk Residual Value.xml
Date of Study:	Fri Oct 02 17:13:02 CDT 2009
Project Name:	Large Office 18% WWR - Norfolk
Project Location:	Nebraska
Analysis Type:	FEMP Analysis, Energy Project
Analyst:	A B Skillman
Base Date:	October 1, 2009
Service Date:	October 1, 2009
Study Period:	20 years 0 months(October 1, 2009 through September 30, 2029
Discount Rate:	3%
Discounting Convention:	End-of-Year

Comparison of Present-Value Costs

PV Life-Cycle Cost

	Base Case	Alternative	Savings from Alternative
Initial Investment Costs:			
Capital Requirements as of Base Date	$592,428	$916,448	-$324,020
Future Costs:			
Energy Consumption Costs	$673,163	$521,774	$151,389
Energy Demand Charges	$0	$0	$0
Energy Utility Rebates	$0	$0	$0
Water Costs	$0	$0	$0
Recurring and Non-Recurring OM&R Costs	$544,438	$476,553	$67,885
Capital Replacements	$134,000	$0	$134,000
Residual Value at End of Study Period	-$258,158	-$274,934	$16,776
Subtotal (for Future Cost Items)	$1,093,442	$723,393	$370,050
Total PV Life-Cycle Cost	$1,685,870	$1,639,841	$46,030

Net Savings from Alternative Compared with Base Case

PV of Non-Investment Savings	$219,274
- Increased Total Investment	$173,244
Net Savings	$46,030

Savings-to-Investment Ratio (SIR)

SIR = 1.27

Adjusted Internal Rate of Return

AIRR = 4.22%

Payback Period

Estimated Years to Payback (from beginning of Service Period)

Simple Payback occurs in year	16
Discounted Payback occurs in year	18

Energy Savings Summary

Energy Savings Summary (in stated units)

Energy Type	Average Annual Consumption Base Case	Alternative	Savings	Life-Cycle Savings
Electricity	567,561.0 kWh	523,513.0 kWh	44,048.0 kWh	880,839.4 kWh
Natural Gas	6,216.0 Therm	0.0 Therm	6,216.0 Therm	124,303.0 Therm

Energy Savings Summary (in MBtu)

Energy Type	Average Annual Consumption Base Case	Alternative	Savings	Life-Cycle Savings
Electricity	1,936.6 MBtu	1,786.3 MBtu	150.3 MBtu	3,005.5 MBtu
Natural Gas	621.6 MBtu	0.0 MBtu	621.6 MBtu	12,430.3 MBtu

Emissions Reduction Summary

Energy Type	Average Annual Emissions Base Case	Alternative	Reduction	Life-Cycle Reduction
Electricity				
CO2	594,088.17 kg	547,981.42 kg	46,106.75 kg	922,008.86 kg
SO2	1,100.24 kg	1,014.85 kg	85.39 kg	1,707.54 kg
NOx	1,197.49 kg	1,104.55 kg	92.94 kg	1,858.47 kg
Natural Gas				
CO2	32,835.11 kg	0.00 kg	32,835.11 kg	656,612.33 kg
SO2	264.99 kg	0.00 kg	264.99 kg	5,299.07 kg
NOx	25.58 kg	0.00 kg	25.58 kg	511.54 kg
Total:				
CO2	626,923.28 kg	547,981.42 kg	78,941.87 kg	1,578,621.19 kg
SO2	1,365.23 kg	1,014.85 kg	350.38 kg	7,006.61 kg
NOx	1,223.07 kg	1,104.55 kg	118.52 kg	2,370.02 kg

NIST BLCC 5.3-09: Comparative Analysis

Consistent with Federal Life Cycle Cost Methodology and Procedures, 10 CFR, Part 436, Subpart A

Base Case: 2003 IECC Base Case

Alternative: 30% Alternative Design

General Information

File Name:	C:\Program Files (x86)\BLCC5\projects\Large Office 18WWR Chadron Residual Value.xml
Date of Study:	Sat Oct 03 08:48:40 CDT 2009
Project Name:	Large Office 18% WWR - Chadron
Project Location:	Nebraska
Analysis Type:	FEMP Analysis, Energy Project
Analyst:	A B Skillman
Base Date:	October 1, 2009
Service Date:	October 1, 2009
Study Period:	20 years 0 months(October 1, 2009 through September 30, 2029
Discount Rate:	3%
Discounting Convention:	End-of-Year

Comparison of Present-Value Costs

PV Life-Cycle Cost

	Base Case	Alternative	Savings from Alternative
Initial Investment Costs:			
Capital Requirements as of Base Date	$579,428	$877,948	-$298,520
Future Costs:			
Energy Consumption Costs	$628,994	$485,664	$143,331
Energy Demand Charges	$0	$0	$0
Energy Utility Rebates	$0	$0	$0
Water Costs	$0	$0	$0
Recurring and Non-Recurring OM&R Costs	$422,462	$383,389	$39,073
Capital Replacements	$121,500	$0	$121,500
Residual Value at End of Study Period	-$243,163	-$263,384	$20,221
Subtotal (for Future Cost Items)	$929,793	$605,668	$324,124
Total PV Life-Cycle Cost	$1,509,221	$1,483,616	$25,604

Net Savings from Alternative Compared with Base Case

PV of Non-Investment Savings	$182,403
- Increased Total Investment	$156,799
Net Savings	$25,604

Savings-to-Investment Ratio (SIR)

SIR = 1.16

Adjusted Internal Rate of Return

AIRR = 3.78%

Payback Period

Estimated Years to Payback (from beginning of Service Period)

Simple Payback occurs in year	16
Discounted Payback occurs in year	20

Energy Savings Summary

Energy Savings Summary (in stated units)

Energy Type	Average Base Case	Annual Alternative	Consumption Savings	Life-Cycle Savings
Electricity	553,904.0 kWh	485,033.0 kWh	68,871.0 kWh	1,377,231.4 kWh
Natural Gas	4,139.0 Therm	0.0 Therm	4,139.0 Therm	82,768.7 Therm

Energy Savings Summary (in MBtu)

Energy Type	Average Base Case	Annual Alternative	Consumption Savings	Life-Cycle Savings
Electricity	1,890.0 MBtu	1,655.0 MBtu	235.0 MBtu	4,699.3 MBtu
Natural Gas	413.9 MBtu	0.0 MBtu	413.9 MBtu	8,276.9 MBtu

Emissions Reduction Summary

Energy Type	Average Base Case	Annual Alternative	Emissions Reduction	Life-Cycle Reduction
Electricity				
CO2	579,792.86 kg	507,702.90 kg	72,089.95 kg	1,441,601.71 kg
SO2	1,073.76 kg	940.25 kg	133.51 kg	2,669.81 kg
NOx	1,168.68 kg	1,023.37 kg	145.31 kg	2,905.81 kg
Natural Gas				
CO2	21,863.66 kg	0.00 kg	21,863.66 kg	437,213.39 kg
SO2	176.45 kg	0.00 kg	176.45 kg	3,528.45 kg
NOx	17.03 kg	0.00 kg	17.03 kg	340.62 kg
Total:				
CO2	601,656.52 kg	507,702.90 kg	93,953.62 kg	1,878,815.10 kg
SO2	1,250.21 kg	940.25 kg	309.96 kg	6,198.26 kg
NOx	1,185.71 kg	1,023.37 kg	162.34 kg	3,246.42 kg

NIST BLCC 5.3-09: Comparative Analysis

Consistent with Federal Life Cycle Cost Methodology and Procedures, 10 CFR, Part 436, Subpart A

Base Case: 2003 IECC Base Case Omaha

Alternative: 30% Alternative Case Omaha

General Information

File Name:	C:\Program Files (x86)\BLCC5\projects\Small Office 38 WWR Omaha Residual Value.xml
Date of Study:	Fri Oct 02 10:28:05 CDT 2009
Project Name:	Small Office 38% WWR - Omaha
Project Location:	Nebraska
Analysis Type:	FEMP Analysis, Energy Project
Analyst:	A B Skillman
Base Date:	October 1, 2009
Service Date:	October 1, 2009
Study Period:	20 years 0 months(October 1, 2009 through September 30, 2029)
Discount Rate:	3%
Discounting Convention:	End-of-Year

Comparison of Present-Value Costs

PV Life-Cycle Cost

	Base Case	Alternative	Savings from Alternative
Initial Investment Costs:			
Capital Requirements as of Base Date	$177,882	$272,758	-$94,876
Future Costs:			
Energy Consumption Costs	$117,661	$88,298	$29,362
Energy Demand Charges	$0	$0	$0
Energy Utility Rebates	$0	$0	$0
Water Costs	$0	$0	$0
Recurring and Non-Recurring OM&R Costs	$154,919	$122,072	$32,848
Capital Replacements	$31,500	$30,000	$1,500
Residual Value at End of Study Period	-$69,710	-$96,977	$27,268
Subtotal (for Future Cost Items)	$234,370	$143,392	$90,978
Total PV Life-Cycle Cost	$412,253	$416,150	-$3,898

Net Savings from Alternative Compared with Base Case

PV of Non-Investment Savings	$62,210
- Increased Total Investment	$66,108
Net Savings	-$3,898

Savings-to-Investment Ratio (SIR)

SIR = 0.94

SIR is lower than 1.0; project alternative is not cost effective.

Adjusted Internal Rate of Return

AIRR 2.60%

AIRR = 2.69%

AIRR is lower than your discount rate; project alternative is not cost effective.

Payback Period

Estimated Years to Payback (from beginning of Service Period)

Discounted Payback never reached during study period.

Simple Payback occurs in year 20

Energy Savings Summary

Energy Savings Summary (in stated units)

Energy Type	Average Base Case	Annual Alternative	Consumption Savings	Life-Cycle Savings
Electricity	84,844.0 kWh	70,015.0 kWh	14,829.0 kWh	296,539.4 kWh
Natural Gas	1,513.0 Therm	810.0 Therm	703.0 Therm	14,058.1 Therm

Energy Savings Summary (in MBtu)

Energy Type	Average Base Case	Annual Alternative	Consumption Savings	Life-Cycle Savings
Electricity	289.5 MBtu	238.9 MBtu	50.6 MBtu	1,011.8 MBtu
Natural Gas	151.3 MBtu	81.0 MBtu	70.3 MBtu	1,405.8 MBtu

Emissions Reduction Summary

Energy Type	Average Base Case	Annual Alternative	Emissions Reduction	Life-Cycle Reduction
Electricity				
CO2	88,809.51 kg	73,287.42 kg	15,522.09 kg	310,399.32 kg
SO2	164.47 kg	135.73 kg	28.75 kg	574.85 kg
NOx	179.01 kg	147.72 kg	31.29 kg	625.67 kg
Natural Gas				
CO2	7,992.20 kg	4,278.71 kg	3,713.49 kg	74,259.73 kg
SO2	64.50 kg	34.53 kg	29.97 kg	599.30 kg
NOx	6.23 kg	3.33 kg	2.89 kg	57.85 kg
Total:				
CO2	96,801.72 kg	77,566.13 kg	19,235.59 kg	384,659.05 kg
SO2	228.97 kg	170.26 kg	58.72 kg	1,174.15 kg
NOx	185.24 kg	151.06 kg	34.18 kg	683.52 kg

NIST BLCC 5.3-09: Comparative Analysis

Consistent with Federal Life Cycle Cost Methodology and Procedures, 10 CFR, Part 436, Subpart A

Base Case: 2003 IECC Base Case Norfolk

Alternative: 30% Alternative Case Norfolk

General Information

File Name:	C:\Program Files (x86)\BLCC5\projects\Small Office 38 WWR Norfolk Residual Value.xml
Date of Study:	Fri Oct 02 11:19:40 CDT 2009
Project Name:	Small Office 38% WWR - Norfolk
Project Location:	Nebraska
Analysis Type:	FEMP Analysis, Energy Project
Analyst:	A B Skillman
Base Date:	October 1, 2009
Service Date:	October 1, 2009
Study Period:	20 years 0 months(October 1, 2009 through September 30, 2029
Discount Rate:	3%
Discounting Convention:	End-of-Year

Comparison of Present-Value Costs

PV Life-Cycle Cost

	Base Case	Alternative	Savings from Alternative
Initial Investment Costs:			
Capital Requirements as of Base Date	$183,258	$274,258	-$91,000
Future Costs:			
Energy Consumption Costs	$114,904	$90,178	$24,725
Energy Demand Charges	$0	$0	$0
Energy Utility Rebates	$0	$0	$0
Water Costs	$0	$0	$0
Recurring and Non-Recurring OM&R Costs	$147,638	$116,326	$31,313
Capital Replacements	$29,000	$28,590	$410
Residual Value at End of Study Period	-$70,327	-$96,715	$26,388
Subtotal (for Future Cost Items)	$221,215	$138,379	$82,836
Total PV Life-Cycle Cost	$404,473	$412,637	-$8,164

Net Savings from Alternative Compared with Base Case

PV of Non-Investment Savings	$56,038
- Increased Total Investment	$64,202
Net Savings	-$8,164

Savings-to-Investment Ratio (SIR)

SIR = 0.87

SIR is lower than 1.0; project alternative is not cost effective.

Adjusted Internal Rate of Return

Adjusted Internal Rate of Return

AIRR = 2.30%

AIRR is lower than your discount rate; project alternative is not cost effective.

Payback Period

Estimated Years to Payback (from beginning of Service Period)

Discounted Payback never reached during study period.

Simple Payback occurs in year 20

Energy Savings Summary

Energy Savings Summary (in stated units)

Energy Type	Average Annual Consumption: Base Case	Alternative	Savings	Life-Cycle Savings
Electricity	82,236.0 kWh	68,667.0 kWh	13,569.0 kWh	271,342.9 kWh
Natural Gas	1,673.0 Therm	946.0 Therm	727.0 Therm	14,538.0 Therm

Energy Savings Summary (in MBtu)

Energy Type	Average Annual Consumption: Base Case	Alternative	Savings	Life-Cycle Savings
Electricity	280.6 MBtu	234.3 MBtu	46.3 MBtu	925.9 MBtu
Natural Gas	167.3 MBtu	94.6 MBtu	72.7 MBtu	1,453.8 MBtu

Emissions Reduction Summary

Energy Type	Average Annual Emissions: Base Case	Alternative	Reduction	Life-Cycle Reduction
Electricity				
CO2	86,079.62 kg	71,876.42 kg	14,203.20 kg	284,025.11 kg
SO2	159.42 kg	133.11 kg	26.30 kg	526.01 kg
NOx	173.51 kg	144.88 kg	28.63 kg	572.50 kg
Natural Gas				
CO2	8,837.38 kg	4,997.11 kg	3,840.27 kg	76,794.91 kg
SO2	71.32 kg	40.33 kg	30.99 kg	619.76 kg
NOx	6.88 kg	3.89 kg	2.99 kg	59.83 kg
Total:				
CO2	94,917.00 kg	76,873.53 kg	18,043.47 kg	360,820.02 kg
SO2	230.74 kg	173.44 kg	57.30 kg	1,145.77 kg
NOx	180.39 kg	148.77 kg	31.62 kg	632.33 kg

NIST BLCC 5.3-09: Comparative Analysis

Consistent with Federal Life Cycle Cost Methodology and Procedures, 10 CFR, Part 436, Subpart A

Base Case: 2003 IECC Base Case Chadron

Alternative: 30% Alternative Case Chadron

General Information

File Name:	C:\Program Files (x86)\BLCC5\projects\Small Office 38 WWR Chadron Residual Value.xml
Date of Study:	Fri Oct 02 13:14:57 CDT 2009
Project Name:	Small Office 38% WWR - Chadron
Project Location:	Nebraska
Analysis Type:	FEMP Analysis, Energy Project
Analyst:	A B Skillman
Base Date:	October 1, 2009
Service Date:	October 1, 2009
Study Period:	20 years 0 months(October 1, 2009 through September 30, 2029
Discount Rate:	3%
Discounting Convention:	End-of-Year

Comparison of Present-Value Costs

PV Life-Cycle Cost

	Base Case	Alternative	Savings from Alternative
Initial Investment Costs:			
Capital Requirements as of Base Date	$184,258	$270,758	-$86,500
Future Costs:			
Energy Consumption Costs	$124,634	$95,013	$29,620
Energy Demand Charges	$0	$0	$0
Energy Utility Rebates	$0	$0	$0
Water Costs	$0	$0	$0
Recurring and Non-Recurring OM&R Costs	$136,174	$107,293	$28,881
Capital Replacements	$30,000	$26,370	$3,630
Residual Value at End of Study Period	-$70,787	-$94,544	$23,757
Subtotal (for Future Cost Items)	$220,020	$134,132	$85,889
Total PV Life-Cycle Cost	$404,278	$404,890	-$612

Net Savings from Alternative Compared with Base Case

PV of Non-Investment Savings	$58,502
- Increased Total Investment	$59,113
Net Savings	-$612

Savings-to-Investment Ratio (SIR)

SIR = 0.99

SIR is lower than 1.0; project alternative is not cost effective.

Adjusted Internal Rate of Return

Adjusted Internal Rate of Return

AIRR = 2.95%

AIRR is lower than your discount rate; project alternative is not cost effective.

Payback Period

Estimated Years to Payback (from beginning of Service Period)

Discounted Payback never reached during study period.

Simple Payback occurs in year 20

Energy Savings Summary

Energy Savings Summary (in stated units)

Energy Type	Average Annual Consumption: Base Case	Alternative	Savings	Life-Cycle Savings
Electricity	87,863.0 kWh	68,491.0 kWh	19,372.0 kWh	387,387.0 kWh
Natural Gas	1,132.0 Therm	744.0 Therm	388.0 Therm	7,758.9 Therm

Energy Savings Summary (in MBtu)

Energy Type	Average Annual Consumption: Base Case	Alternative	Savings	Life-Cycle Savings
Electricity	299.8 MBtu	233.7 MBtu	66.1 MBtu	1,321.8 MBtu
Natural Gas	113.2 MBtu	74.4 MBtu	38.8 MBtu	775.9 MBtu

Emissions Reduction Summary

Energy Type	Average Annual Emissions: Base Case	Alternative	Reduction	Life-Cycle Reduction
Electricity				
CO2	91,969.62 kg	71,692.19 kg	20,277.43 kg	405,493.00 kg
SO2	170.33 kg	132.77 kg	37.55 kg	750.96 kg
NOx	185.38 kg	144.51 kg	40.87 kg	817.34 kg
Natural Gas				
CO2	5,979.62 kg	3,930.07 kg	2,049.55 kg	40,985.45 kg
SO2	48.26 kg	31.72 kg	16.54 kg	330.77 kg
NOx	4.66 kg	3.06 kg	1.60 kg	31.93 kg
Total:				
CO2	97,949.24 kg	75,622.26 kg	22,326.98 kg	446,478.45 kg
SO2	218.58 kg	164.49 kg	54.09 kg	1,081.73 kg
NOx	190.04 kg	147.57 kg	42.47 kg	849.27 kg

NIST BLCC 5.3-09: Comparative Analysis

Consistent with Federal Life Cycle Cost Methodology and Procedures, 10 CFR, Part 436, Subpart A

Base Case: 2003 IECC Base Case Omaha

Alternative: 30% Alternative Case Omaha

General Information

File Name:	J:\002-10106-000\E Design SD-DD-CD\05 Engineering Calculations\Mechanical\2009 10 0 FINAL SUBMITTAL DOCS\BLCC Files\Small Office 18 WWR Omaha Residual Value.xm
Date of Study:	Fri Oct 02 17:34:51 CDT 2009
Project Name:	Small Office 18% WWR - Omaha
Project Location:	Nebraska
Analysis Type:	FEMP Analysis, Energy Project
Analyst:	A B Skillman
Base Date:	October 1, 2009
Service Date:	October 1, 2009
Study Period:	20 years 0 months(October 1, 2009 through September 30, 2029
Discount Rate:	3%
Discounting Convention:	End-of-Year

Comparison of Present-Value Costs

PV Life-Cycle Cost

	Base Case	Alternative	Savings from Alternative
Initial Investment Costs:			
Capital Requirements as of Base Date	$167,582	$249,739	-$82,157
Future Costs:			
Energy Consumption Costs	$104,822	$81,333	$23,489
Energy Demand Charges	$0	$0	$0
Energy Utility Rebates	$0	$0	$0
Water Costs	$0	$0	$0
Recurring and Non-Recurring OM&R Costs	$138,899	$122,062	$16,837
Capital Replacements	$28,500	$30,000	-$1,500
Residual Value at End of Study Period	-$62,740	-$90,072	$27,332
Subtotal (for Future Cost Items)	$209,481	$143,323	$66,158
Total PV Life-Cycle Cost	$377,064	$393,062	-$15,999

Net Savings from Alternative Compared with Base Case

PV of Non-Investment Savings	$40,326
- Increased Total Investment	$56,325
Net Savings	-$15,999

Savings-to-Investment Ratio (SIR)

SIR = 0.72

SIR is lower than 1.0; project alternative is not cost effective.

Adjusted Internal Rate of Return

Adjusted Internal Rate of Return

AIRR = 1.29%

AIRR is lower than your discount rate; project alternative is not cost effective.

Payback Period

Estimated Years to Payback (from beginning of Service Period)

Discounted Payback never reached during study period.

Simple Payback occurs in year 20

Energy Savings Summary

Energy Savings Summary (in stated units)

Energy Type	Average Annual Consumption Base Case	Alternative	Savings	Life-Cycle Savings
Electricity	75,349.0 kWh	66,117.0 kWh	9,232.0 kWh	184,614.7 kWh
Natural Gas	1,378.0 Therm	629.0 Therm	749.0 Therm	14,977.9 Therm

Energy Savings Summary (in MBtu)

Energy Type	Average Annual Consumption Base Case	Alternative	Savings	Life-Cycle Savings
Electricity	257.1 MBtu	225.6 MBtu	31.5 MBtu	629.9 MBtu
Natural Gas	137.8 MBtu	62.9 MBtu	74.9 MBtu	1,497.8 MBtu

Emissions Reduction Summary

Energy Type	Average Annual Emissions Base Case	Alternative	Reduction	Life-Cycle Reduction
Electricity				
CO2	78,870.73 kg	69,207.24 kg	9,663.49 kg	193,243.41 kg
SO2	146.07 kg	128.17 kg	17.90 kg	357.88 kg
NOx	158.98 kg	139.50 kg	19.48 kg	389.52 kg
Natural Gas				
CO2	7,279.08 kg	3,322.60 kg	3,956.48 kg	79,118.83 kg
SO2	58.74 kg	26.81 kg	31.93 kg	638.51 kg
NOx	5.67 kg	2.59 kg	3.08 kg	61.64 kg
Total:				
CO2	86,149.81 kg	72,529.84 kg	13,619.98 kg	272,362.24 kg
SO2	204.81 kg	154.98 kg	49.83 kg	996.40 kg
NOx	164.65 kg	142.09 kg	22.56 kg	451.16 kg

NIST BLCC 5.3-09: Comparative Analysis

Consistent with Federal Life Cycle Cost Methodology and Procedures, 10 CFR, Part 436, Subpart A

Base Case: 2003 IECC Base Case Norfolk

Alternative: 30% Alternative Case Norfolk

General Information

File Name:	J:\002-10106-000\E Design SD-DD-CD\05 Engineering Calculations\Mechanical\2009 10 0 FINAL SUBMITTAL DOCS\BLCC Files\Small Office 18 WWR Norfolk Residual Value.xm
Date of Study:	Fri Oct 02 17:43:13 CDT 2009
Project Name:	Small Office 18% WWR - Norfolk
Project Location:	Nebraska
Analysis Type:	FEMP Analysis, Energy Project
Analyst:	A B Skillman
Base Date:	October 1, 2009
Service Date:	October 1, 2009
Study Period:	20 years 0 months(October 1, 2009 through September 30, 2029
Discount Rate:	3%
Discounting Convention:	End-of-Year

Comparison of Present-Value Costs

PV Life-Cycle Cost

	Base Case	Alternative	Savings from Alternative
Initial Investment Costs:			
Capital Requirements as of Base Date	$172,716	$249,739	-$77,023
Future Costs:			
Energy Consumption Costs	$103,828	$82,769	$21,059
Energy Demand Charges	$0	$0	$0
Energy Utility Rebates	$0	$0	$0
Water Costs	$0	$0	$0
Recurring and Non-Recurring OM&R Costs	$132,371	$116,326	$16,046
Capital Replacements	$28,500	$28,590	-$90
Residual Value at End of Study Period	-$64,280	-$89,360	$25,080
Subtotal (for Future Cost Items)	$200,419	$138,325	$62,094
Total PV Life-Cycle Cost	$373,135	$388,064	-$14,929

Net Savings from Alternative Compared with Base Case

PV of Non-Investment Savings	$37,105
- Increased Total Investment	$52,033
Net Savings	-$14,929

Savings-to-Investment Ratio (SIR)

SIR = 0.71

SIR is lower than 1.0; project alternative is not cost effective.

Adjusted Internal Rate of Return

Adjusted Internal Rate of Return

AIRR = 1.27%

AIRR is lower than your discount rate; project alternative is not cost effective.

Payback Period

Estimated Years to Payback (from beginning of Service Period)

Discounted Payback never reached during study period.

Simple Payback occurs in year 20

Energy Savings Summary

Energy Savings Summary (in stated units)

Energy Type	Average Annual Consumption – Base Case	Alternative	Savings	Life-Cycle Savings
Electricity	72,652.0 kWh	64,652.0 kWh	8,000.0 kWh	159,978.1 kWh
Natural Gas	1,593.0 Therm	721.0 Therm	872.0 Therm	17,437.6 Therm

Energy Savings Summary (in MBtu)

Energy Type	Average Annual Consumption – Base Case	Alternative	Savings	Life-Cycle Savings
Electricity	247.9 MBtu	220.6 MBtu	27.3 MBtu	545.9 MBtu
Natural Gas	159.3 MBtu	72.1 MBtu	87.2 MBtu	1,743.8 MBtu

Emissions Reduction Summary

Energy Type	Average Annual Emissions – Base Case	Alternative	Reduction	Life-Cycle Reduction
Electricity				
CO2	76,047.67 kg	67,673.76 kg	8,373.91 kg	167,455.30 kg
SO2	140.84 kg	125.33 kg	15.51 kg	310.12 kg
NOx	153.29 kg	136.41 kg	16.88 kg	337.54 kg
Natural Gas				
CO2	8,414.79 kg	3,808.58 kg	4,606.21 kg	92,111.64 kg
SO2	67.91 kg	30.74 kg	37.17 kg	743.37 kg
NOx	6.56 kg	2.97 kg	3.59 kg	71.76 kg
Total:				
CO2	84,462.46 kg	71,482.34 kg	12,980.12 kg	259,566.94 kg
SO2	208.75 kg	156.07 kg	52.68 kg	1,053.49 kg
NOx	159.84 kg	139.38 kg	20.47 kg	409.30 kg

NIST BLCC 5.3-09: Comparative Analysis

Consistent with Federal Life Cycle Cost Methodology and Procedures, 10 CFR, Part 436, Subpart A

Base Case: 2003 IECC Base Case Chadron

Alternative: 30% Alternative Case Chadron

General Information

File Name:	J:\002-10106-000\E Design SD-DD-CD\05 Engineering Calculations\Mechanical\2009 10 0 FINAL SUBMITTAL DOCS\BLCC Files\Small Office 18 WWR Chadron Residual Value.xm
Date of Study:	Fri Oct 02 17:46:38 CDT 2009
Project Name:	Small Office 18% WWR - Chadron
Project Location:	Nebraska
Analysis Type:	FEMP Analysis, Energy Project
Analyst:	A B Skillman
Base Date:	October 1, 2009
Service Date:	October 1, 2009
Study Period:	20 years 0 months(October 1, 2009 through September 30, 2029
Discount Rate:	3%
Discounting Convention:	End-of-Year

Comparison of Present-Value Costs

PV Life-Cycle Cost

	Base Case	Alternative	Savings from Alternative
Initial Investment Costs:			
Capital Requirements as of Base Date	$172,716	$249,739	-$77,023
Future Costs:			
Energy Consumption Costs	$94,598	$77,694	$16,904
Energy Demand Charges	$0	$0	$0
Energy Utility Rebates	$0	$0	$0
Water Costs	$0	$0	$0
Recurring and Non-Recurring OM&R Costs	$122,093	$103,255	$18,837
Capital Replacements	$28,000	$26,370	$1,630
Residual Value at End of Study Period	-$63,945	-$88,239	$24,294
Subtotal (for Future Cost Items)	$180,746	$119,081	$61,666
Total PV Life-Cycle Cost	$353,462	$368,820	-$15,357

Net Savings from Alternative Compared with Base Case

PV of Non-Investment Savings	$35,742
- Increased Total Investment	$51,099
Net Savings	-$15,357

Savings-to-Investment Ratio (SIR)

SIR = 0.70

SIR is lower than 1.0; project alternative is not cost effective.

Adjusted Internal Rate of Return

Adjusted Internal Rate of Return

AIRR = 1.18%

AIRR is lower than your discount rate; project alternative is not cost effective.

Payback Period

Estimated Years to Payback (from beginning of Service Period)

Discounted Payback never reached during study period.

Simple Payback occurs in year 20

Energy Savings Summary

Energy Savings Summary (in stated units)

Energy Type	Average Annual Consumption: Base Case	Alternative	Savings	Life-Cycle Savings
Electricity	71,216.0 kWh	64,711.0 kWh	6,505.0 kWh	130,082.2 kWh
Natural Gas	1,231.0 Therm	561.0 Therm	670.0 Therm	13,398.2 Therm

Energy Savings Summary (in MBtu)

Energy Type	Average Annual Consumption: Base Case	Alternative	Savings	Life-Cycle Savings
Electricity	243.0 MBtu	220.8 MBtu	22.2 MBtu	443.9 MBtu
Natural Gas	123.1 MBtu	56.1 MBtu	67.0 MBtu	1,339.8 MBtu

Emissions Reduction Summary

Energy Type	Average Annual Emissions: Base Case	Alternative	Reduction	Life-Cycle Reduction
Electricity				
CO2	74,544.56 kg	67,735.52 kg	6,809.04 kg	136,162.09 kg
SO2	138.05 kg	125.44 kg	12.61 kg	252.17 kg
NOx	150.26 kg	136.53 kg	13.72 kg	274.46 kg
Natural Gas				
CO2	6,502.58 kg	2,963.40 kg	3,539.18 kg	70,773.85 kg
SO2	52.48 kg	23.92 kg	28.56 kg	571.17 kg
NOx	5.07 kg	2.31 kg	2.76 kg	55.14 kg
Total:				
CO2	81,047.13 kg	70,698.92 kg	10,348.21 kg	206,935.94 kg
SO2	190.53 kg	149.36 kg	41.17 kg	823.34 kg
NOx	155.32 kg	138.84 kg	16.48 kg	329.60 kg

NIST BLCC 5.3-09: Comparative Analysis

Consistent with Federal Life Cycle Cost Methodology and Procedures, 10 CFR, Part 436, Subpart A

Base Case: 2003 IECC Base Case

Alternative: Alternative 30% Better

General Information

File Name:	C:\Program Files (x86)\BLCC5\projects\Small Retail 8WWR Omaha Residual Value.xml
Date of Study:	Mon Oct 05 14:23:41 CDT 2009
Project Name:	Small Retail 8% WWR - Omaha
Project Location:	Nebraska
Analysis Type:	FEMP Analysis, Energy Project
Analyst:	NR Decker
Base Date:	October 1, 2009
Service Date:	October 1, 2009
Study Period:	20 years 0 months(October 1, 2009 through September 30, 2029)
Discount Rate:	3%
Discounting Convention:	End-of-Year

Comparison of Present-Value Costs

PV Life-Cycle Cost

	Base Case	Alternative	Savings from Alternative
Initial Investment Costs:			
Capital Requirements as of Base Date	$79,190	$102,780	-$23,590
Future Costs:			
Energy Consumption Costs	$117,764	$84,192	$33,573
Energy Demand Charges	$0	$0	$0
Energy Utility Rebates	$0	$0	$0
Water Costs	$0	$0	$0
Recurring and Non-Recurring OM&R Costs	$147,806	$113,438	$34,368
Capital Replacements	$18,000	$30,000	-$12,000
Residual Value at End of Study Period	-$33,777	-$45,984	$12,207
Subtotal (for Future Cost Items)	$249,794	$181,646	$68,148
Total PV Life-Cycle Cost	$328,984	$284,426	$44,558

Net Savings from Alternative Compared with Base Case

PV of Non-Investment Savings	$67,941
- Increased Total Investment	$23,383
Net Savings	$44,558

Savings-to-Investment Ratio (SIR)

SIR = 2.91

Adjusted Internal Rate of Return

AIRR = 8.64%

Payback Period

Estimated Years to Payback (from beginning of Service Period)

Simple Payback occurs in year	8
Discounted Payback occurs in year	9

Energy Savings Summary

Energy Savings Summary (in stated units)

Energy Type	Average Annual Consumption - Base Case	Average Annual Consumption - Alternative	Annual Consumption Savings	Life-Cycle Savings
Electricity	76,114.0 kWh	63,277.0 kWh	12,837.0 kWh	256,704.9 kWh
Natural Gas	2,504.0 Therm	1,237.0 Therm	1,267.0 Therm	25,336.5 Therm

Energy Savings Summary (in MBtu)

Energy Type	Average Annual Consumption - Base Case	Average Annual Consumption - Alternative	Annual Consumption Savings	Life-Cycle Savings
Electricity	259.7 MBtu	215.9 MBtu	43.8 MBtu	875.9 MBtu
Natural Gas	250.4 MBtu	123.7 MBtu	126.7 MBtu	2,533.7 MBtu

Emissions Reduction Summary

Energy Type	Average Annual Emissions - Base Case	Average Annual Emissions - Alternative	Annual Emissions Reduction	Life-Cycle Reduction
Electricity				
CO2	79,671.48 kg	66,234.50 kg	13,436.99 kg	268,702.95 kg
SO2	147.55 kg	122.66 kg	24.88 kg	497.63 kg
NOx	160.59 kg	133.51 kg	27.08 kg	541.62 kg
Natural Gas				
CO2	13,227.01 kg	6,534.27 kg	6,692.74 kg	133,836.52 kg
SO2	106.75 kg	52.73 kg	54.01 kg	1,080.10 kg
NOx	10.30 kg	5.09 kg	5.21 kg	104.27 kg
Total:				
CO2	92,898.50 kg	72,768.77 kg	20,129.73 kg	402,539.48 kg
SO2	254.30 kg	175.40 kg	78.90 kg	1,577.73 kg
NOx	170.90 kg	138.60 kg	32.30 kg	645.89 kg

NIST BLCC 5.3-09: Comparative Analysis

Consistent with Federal Life Cycle Cost Methodology and Procedures, 10 CFR, Part 436, Subpart A

Base Case: 2003 IECC Base Case

Alternative: Alternative 30% Better

General Information

File Name:	C:\Program Files (x86)\BLCC5\projects\Small Retail 8WWR Norfolk Residual Value.xml
Date of Study:	Mon Oct 05 14:30:01 CDT 2009
Project Name:	Small Retail 8% WWR - Norfolk
Project Location:	Nebraska
Analysis Type:	FEMP Analysis, Energy Project
Analyst:	NR Decker
Base Date:	October 1, 2009
Service Date:	October 1, 2009
Study Period:	20 years 0 months(October 1, 2009 through September 30, 2029)
Discount Rate:	3%
Discounting Convention:	End-of-Year

Comparison of Present-Value Costs

PV Life-Cycle Cost

	Base Case	Alternative	Savings from Alternative
Initial Investment Costs:			
Capital Requirements as of Base Date	$79,690	$105,780	-$26,090
Future Costs:			
Energy Consumption Costs	$123,269	$89,251	$34,018
Energy Demand Charges	$0	$0	$0
Energy Utility Rebates	$0	$0	$0
Water Costs	$0	$0	$0
Recurring and Non-Recurring OM&R Costs	$140,859	$108,106	$32,753
Capital Replacements	$17,154	$28,590	-$11,436
Residual Value at End of Study Period	-$33,456	-$46,172	$12,716
Subtotal (for Future Cost Items)	$247,826	$179,776	$68,051
Total PV Life-Cycle Cost	$327,516	$285,556	$41,961

Net Savings from Alternative Compared with Base Case

PV of Non-Investment Savings	$66,771
- Increased Total Investment	$24,810
Net Savings	$41,961

Savings-to-Investment Ratio (SIR)

SIR = 2.69

Adjusted Internal Rate of Return

AIRR = 8.23%

Payback Period

Estimated Years to Payback (from beginning of Service Period)

Simple Payback occurs in year	9
Discounted Payback occurs in year	10

Energy Savings Summary

Energy Savings Summary (in stated units)

Energy Type	Average Annual Consumption Base Case	Alternative	Savings	Life-Cycle Savings
Electricity	73,359.0 kWh	60,668.0 kWh	12,691.0 kWh	253,785.3 kWh
Natural Gas	2,972.0 Therm	1,443.0 Therm	1,529.0 Therm	30,575.8 Therm

Energy Savings Summary (in MBtu)

Energy Type	Average Annual Consumption Base Case	Alternative	Savings	Life-Cycle Savings
Electricity	250.3 MBtu	207.0 MBtu	43.3 MBtu	866.0 MBtu
Natural Gas	297.2 MBtu	144.3 MBtu	152.9 MBtu	3,057.6 MBtu

Emissions Reduction Summary

Energy Type	Average Annual Emissions Base Case	Alternative	Reduction	Life-Cycle Reduction
Electricity				
CO2	76,787.72 kg	63,503.56 kg	13,284.16 kg	265,646.90 kg
SO2	142.21 kg	117.61 kg	24.60 kg	491.97 kg
NOx	154.78 kg	128.00 kg	26.78 kg	535.46 kg
Natural Gas				
CO2	15,699.16 kg	7,622.44 kg	8,076.72 kg	161,512.27 kg
SO2	126.70 kg	61.52 kg	65.18 kg	1,303.45 kg
NOx	12.23 kg	5.94 kg	6.29 kg	125.83 kg
Total:				
CO2	92,486.87 kg	71,125.99 kg	21,360.88 kg	427,159.16 kg
SO2	268.91 kg	179.12 kg	89.78 kg	1,795.43 kg
NOx	167.01 kg	133.94 kg	33.07 kg	661.29 kg

NIST BLCC 5.3-09: Comparative Analysis

Consistent with Federal Life Cycle Cost Methodology and Procedures, 10 CFR, Part 436, Subpart A

Base Case: 2003 IECC Base Case

Alternative: Alternative 30% Better

General Information

File Name:	C:\Program Files (x86)\BLCC5\projects\Small Retail 8WWR Chadron Residual Value.xml
Date of Study:	Mon Oct 05 14:33:07 CDT 2009
Project Name:	Small Retail 8% WWR - Chadron
Project Location:	Nebraska
Analysis Type:	FEMP Analysis, Energy Project
Analyst:	NR Decker
Base Date:	October 1, 2009
Service Date:	October 1, 2009
Study Period:	20 years 0 months(October 1, 2009 through September 30, 2029)
Discount Rate:	3%
Discounting Convention:	End-of-Year

Comparison of Present-Value Costs

PV Life-Cycle Cost

	Base Case	Alternative	Savings from Alternative
Initial Investment Costs:			
Capital Requirements as of Base Date	$73,690	$99,780	-$26,090
Future Costs:			
Energy Consumption Costs	$109,611	$78,102	$31,509
Energy Demand Charges	$0	$0	$0
Energy Utility Rebates	$0	$0	$0
Water Costs	$0	$0	$0
Recurring and Non-Recurring OM&R Costs	$116,192	$99,712	$16,480
Capital Replacements	$15,822	$26,370	-$10,548
Residual Value at End of Study Period	-$29,121	-$43,251	$14,129
Subtotal (for Future Cost Items)	$212,503	$160,933	$51,570
Total PV Life-Cycle Cost	$286,193	$260,713	$25,480

Net Savings from Alternative Compared with Base Case

PV of Non-Investment Savings	$47,989
- Increased Total Investment	$22,509
Net Savings	$25,480

Savings-to-Investment Ratio (SIR)

SIR = 2.13

Adjusted Internal Rate of Return

AIRR = 6.97%

Payback Period

Estimated Years to Payback (from beginning of Service Period)

Simple Payback occurs in year	11
Discounted Payback occurs in year	11

Energy Savings Summary

Energy Savings Summary (in stated units)

Energy Type	Average Annual Consumption Base Case	Alternative	Savings	Life-Cycle Savings
Electricity	70,223.0 kWh	58,030.0 kWh	12,193.0 kWh	243,826.6 kWh
Natural Gas	2,343.0 Therm	1,055.0 Therm	1,288.0 Therm	25,756.5 Therm

Energy Savings Summary (in MBtu)

Energy Type	Average Annual Consumption Base Case	Alternative	Savings	Life-Cycle Savings
Electricity	239.6 MBtu	198.0 MBtu	41.6 MBtu	832.0 MBtu
Natural Gas	234.3 MBtu	105.5 MBtu	128.8 MBtu	2,575.7 MBtu

Emissions Reduction Summary

Energy Type	Average Annual Emissions Base Case	Alternative	Reduction	Life-Cycle Reduction
Electricity				
CO2	73,505.15 kg	60,742.26 kg	12,762.89 kg	255,222.80 kg
SO2	136.13 kg	112.49 kg	23.64 kg	472.67 kg
NOx	148.16 kg	122.44 kg	25.73 kg	514.45 kg
Natural Gas				
CO2	12,376.55 kg	5,572.88 kg	6,803.67 kg	136,054.81 kg
SO2	99.88 kg	44.97 kg	54.91 kg	1,098.01 kg
NOx	9.64 kg	4.34 kg	5.30 kg	106.00 kg
Total:				
CO2	85,881.70 kg	66,315.14 kg	19,566.56 kg	391,277.61 kg
SO2	236.01 kg	157.47 kg	78.54 kg	1,570.67 kg
NOx	157.80 kg	126.78 kg	31.03 kg	620.44 kg

NIST BLCC 5.3-09: Comparative Analysis

Consistent with Federal Life Cycle Cost Methodology and Procedures, 10 CFR, Part 436, Subpart A

Base Case: 2003 IECC Base Case Omaha

Alternative: 30% Alternative Case Omaha

General Information

File Name:	C:\Program Files (x86)\BLCC5\projects\Strip Retail Omaha Residual Value.xml
Date of Study:	Mon Oct 05 13:58:26 CDT 2009
Project Name:	Strip Retail - Omaha
Project Location:	Nebraska
Analysis Type:	FEMP Analysis, Energy Project
Analyst:	A B Skillman
Base Date:	October 1, 2009
Service Date:	October 1, 2009
Study Period:	20 years 0 months(October 1, 2009 through September 30, 2029)
Discount Rate:	3%
Discounting Convention:	End-of-Year

Comparison of Present-Value Costs

PV Life-Cycle Cost

	Base Case	Alternative	Savings from Alternative
Initial Investment Costs:			
Capital Requirements as of Base Date	$208,042	$320,837	-$112,795
Future Costs:			
Energy Consumption Costs	$582,795	$331,310	$251,485
Energy Demand Charges	$0	$0	$0
Energy Utility Rebates	$0	$0	$0
Water Costs	$0	$0	$0
Recurring and Non-Recurring OM&R Costs	$483,518	$479,690	$3,828
Capital Replacements	$83,000	$122,500	-$39,500
Residual Value at End of Study Period	-$105,103	-$158,726	$53,623
Subtotal (for Future Cost Items)	$1,044,211	$774,774	$269,437
Total PV Life-Cycle Cost	$1,252,253	$1,095,611	$156,642

Net Savings from Alternative Compared with Base Case

PV of Non-Investment Savings	$255,314
- Increased Total Investment	$98,671
Net Savings	$156,642

Savings-to-Investment Ratio (SIR)

SIR = 2.59

Adjusted Internal Rate of Return

AIRR = 8.02%

Payback Period

Estimated Years to Payback (from beginning of Service Period)

Simple Payback occurs in year	8
Discounted Payback occurs in year	9

Energy Savings Summary

Energy Savings Summary (in stated units)

Energy Type	Average Annual Consumption Base Case	Alternative	Savings	Life-Cycle Savings
Electricity	331,272.0 kWh	261,254.0 kWh	70,018.0 kWh	1,400,168.3 kWh
Natural Gas	10,438.0 Therm	5,905.0 Therm	4,533.0 Therm	90,647.6 Therm

Energy Savings Summary (in MBtu)

Energy Type	Average Annual Consumption Base Case	Alternative	Savings	Life-Cycle Savings
Electricity	1,130.3 MBtu	891.4 MBtu	238.9 MBtu	4,777.6 MBtu
Natural Gas	1,043.8 MBtu	590.5 MBtu	453.3 MBtu	9,064.8 MBtu

Emissions Reduction Summary

Energy Type	Average Annual Emissions Base Case	Alternative	Reduction	Life-Cycle Reduction
Electricity				
CO2	346,755.29 kg	273,464.72 kg	73,290.56 kg	1,465,610.61 kg
SO2	642.18 kg	506.45 kg	135.73 kg	2,714.27 kg
NOx	698.95 kg	551.22 kg	147.73 kg	2,954.20 kg
Natural Gas				
CO2	55,137.21 kg	31,192.30 kg	23,944.91 kg	478,832.64 kg
SO2	444.97 kg	251.73 kg	193.24 kg	3,864.33 kg
NOx	42.96 kg	24.30 kg	18.65 kg	373.04 kg
Total:				
CO2	401,892.49 kg	304,657.02 kg	97,235.47 kg	1,944,443.25 kg
SO2	1,087.16 kg	758.18 kg	328.98 kg	6,578.60 kg
NOx	741.90 kg	575.52 kg	166.38 kg	3,327.24 kg

NIST BLCC 5.3-09: Comparative Analysis

Consistent with Federal Life Cycle Cost Methodology and Procedures, 10 CFR, Part 436, Subpart A

Base Case: 2003 IECC Base Case Norfolk

Alternative: 30% Alternative Case Norfolk

General Information

File Name:	C:\Program Files (x86)\BLCC5\projects\Strip Retail Norfolk Residual Value.xml
Date of Study:	Mon Oct 05 14:08:02 CDT 2009
Project Name:	Strip Retail - Norfolk
Project Location:	Nebraska
Analysis Type:	FEMP Analysis, Energy Project
Analyst:	A B Skillman
Base Date:	October 1, 2009
Service Date:	October 1, 2009
Study Period:	20 years 0 months(October 1, 2009 through September 30, 2029)
Discount Rate:	3%
Discounting Convention:	End-of-Year

Comparison of Present-Value Costs

PV Life-Cycle Cost

	Base Case	Alternative	Savings from Alternative
Initial Investment Costs:			
Capital Requirements as of Base Date	$206,325	$313,637	-$107,312
Future Costs:			
Energy Consumption Costs	$495,775	$349,703	$146,072
Energy Demand Charges	$0	$0	$0
Energy Utility Rebates	$0	$0	$0
Water Costs	$0	$0	$0
Recurring and Non-Recurring OM&R Costs	$460,793	$457,155	$3,638
Capital Replacements	$75,000	$116,742	-$41,742
Residual Value at End of Study Period	-$100,928	-$153,630	$52,702
Subtotal (for Future Cost Items)	$930,641	$769,971	$160,670
Total PV Life-Cycle Cost	$1,136,966	$1,083,607	$53,358

Net Savings from Alternative Compared with Base Case

PV of Non-Investment Savings	$149,710
- Increased Total Investment	$96,352
Net Savings	$53,358

Savings-to-Investment Ratio (SIR)

SIR = 1.55

Adjusted Internal Rate of Return

AIRR = 5.30%

Payback Period

Estimated Years to Payback (from beginning of Service Period)

Simple Payback occurs in year	11
Simple Payback is negated in year	13
Simple Payback occurs in year	16
Discounted Payback occurs in year	16
Discounted Payback is negated in year	17
Discounted Payback occurs in year	20

Energy Savings Summary

Energy Savings Summary (in stated units)

Energy	-----Average	Annual	Consumption-----	Life-Cycle
Type	Base Case	Alternative	Savings	Savings
Electricity	316,618.0 kWh	249,062.0 kWh	67,556.0 kWh	1,350,935.0 kWh
Natural Gas	12,007.0 Therm	6,527.0 Therm	5,480.0 Therm	109,585.0 Therm

Energy Savings Summary (in MBtu)

Energy	-----Average	Annual	Consumption-----	Life-Cycle
Type	Base Case	Alternative	Savings	Savings
Electricity	1,080.3 MBtu	849.8 MBtu	230.5 MBtu	4,609.6 MBtu
Natural Gas	1,200.7 MBtu	652.7 MBtu	548.0 MBtu	10,958.5 MBtu

Emissions Reduction Summary

Energy	-----Average	Annual	Emissions-----	Life-Cycle
Type	Base Case	Alternative	Reduction	Reduction
Electricity				
CO2	331,416.37 kg	260,702.88 kg	70,713.49 kg	1,414,076.25 kg
SO2	613.77 kg	482.82 kg	130.96 kg	2,618.83 kg
NOx	668.03 kg	525.49 kg	142.54 kg	2,850.32 kg
Natural Gas				
CO2	63,425.22 kg	34,477.92 kg	28,947.30 kg	578,866.72 kg
SO2	511.86 kg	278.25 kg	233.61 kg	4,671.64 kg
NOx	49.41 kg	26.86 kg	22.55 kg	450.97 kg
Total:				
CO2	394,841.60 kg	295,180.80 kg	99,660.79 kg	1,992,942.97 kg
SO2	1,125.64 kg	761.06 kg	364.57 kg	7,290.47 kg
NOx	717.44 kg	552.35 kg		

NIST BLCC 5.3-09: Comparative Analysis

Consistent with Federal Life Cycle Cost Methodology and Procedures, 10 CFR, Part 436, Subpart A

Base Case: 2003 IECC Base Case Chadron

Alternative: 30% Alternative Case Chadron

General Information

File Name:	C:\Program Files (x86)\BLCC5\projects\Strip Retail Chadron Residual Value.xml
Date of Study:	Mon Oct 05 14:16:16 CDT 2009
Project Name:	Strip Retail - Chadron
Project Location:	Nebraska
Analysis Type:	FEMP Analysis, Energy Project
Analyst:	A B Skillman
Base Date:	October 1, 2009
Service Date:	October 1, 2009
Study Period:	20 years 0 months(October 1, 2009 through September 30, 2029)
Discount Rate:	3%
Discounting Convention:	End-of-Year

Comparison of Present-Value Costs

PV Life-Cycle Cost

	Base Case	Alternative	Savings from Alternative
Initial Investment Costs:			
Capital Requirements as of Base Date	$197,325	$299,237	-$101,912
Future Costs:			
Energy Consumption Costs	$446,046	$321,998	$124,047
Energy Demand Charges	$0	$0	$0
Energy Utility Rebates	$0	$0	$0
Water Costs	$0	$0	$0
Recurring and Non-Recurring OM&R Costs	$410,931	$414,451	-$3,520
Capital Replacements	$66,000	$107,678	-$41,678
Residual Value at End of Study Period	-$86,418	-$144,687	$58,269
Subtotal (for Future Cost Items)	$836,559	$699,440	$137,119
Total PV Life-Cycle Cost	$1,033,884	$998,677	$35,208

Net Savings from Alternative Compared with Base Case

PV of Non-Investment Savings	$120,528
- Increased Total Investment	$85,320
Net Savings	$35,208

Savings-to-Investment Ratio (SIR)

SIR = 1.41

Adjusted Internal Rate of Return

AIRR = 4.79%

Payback Period

Estimated Years to Payback (from beginning of Service Period)

Simple Payback occurs in year	15
Simple Payback is negated in year	17
Simple Payback occurs in year	20
Discounted Payback occurs in year	16
Discounted Payback is negated in year	17
Discounted Payback occurs in year	20

Energy Savings Summary

Energy Savings Summary (in stated units)

Energy	-----Average	Annual	Consumption-----	Life-Cycle
Type	Base Case	Alternative	Savings	Savings
Electricity	299,472.0 kWh	239,742.0 kWh	59,730.0 kWh	1,194,436.5 kWh
Natural Gas	9,533.0 Therm	5,206.0 Therm	4,327.0 Therm	86,528.2 Therm

Energy Savings Summary (in MBtu)

Energy	-----Average	Annual	Consumption-----	Life-Cycle
Type	Base Case	Alternative	Savings	Savings
Electricity	1,021.8 MBtu	818.0 MBtu	203.8 MBtu	4,075.6 MBtu
Natural Gas	953.3 MBtu	520.6 MBtu	432.7 MBtu	8,652.8 MBtu

Emissions Reduction Summary

Energy	-----Average	Annual	Emissions-----	Life-Cycle
Type	Base Case	Alternative	Reduction	Reduction
Electricity				
CO2	313,468.99 kg	250,947.28 kg	62,521.71 kg	1,250,263.10 kg
SO2	580.54 kg	464.75 kg	115.79 kg	2,315.46 kg
NOx	631.85 kg	505.83 kg	126.02 kg	2,520.13 kg
Natural Gas				
CO2	50,356.68 kg	27,499.93 kg	22,856.74 kg	457,072.32 kg
SO2	406.39 kg	221.93 kg	184.46 kg	3,688.72 kg
NOx	39.23 kg	21.42 kg	17.81 kg	356.09 kg
Total:				
CO2	363,825.67 kg	278,447.21 kg	85,378.46 kg	1,707,335.42 kg
SO2	986.93 kg	686.68 kg	300.25 kg	6,004.17 kg
NOx	671.08 kg	527.25 kg	143.83 kg	2,876.22 kg

NIST BLCC 5.3-09: Comparative Analysis

Consistent with Federal Life Cycle Cost Methodology and Procedures, 10 CFR, Part 436, Subpart A

Base Case: 2003 IECC Base Case

Alternative: Alternative 30% Better

General Information

File Name:	C:\Program Files\BLCC5\projects\Residual Values\Large Big Box Retail 2WWR Omaha Residual Value.xml
Date of Study:	Thu Oct 08 10:14:24 CDT 2009
Project Name:	Large Big Box Retail 2% WWR - Omaha
Project Location:	Nebraska
Analysis Type:	FEMP Analysis, Energy Project
Analyst:	NR Decker
Base Date:	October 1, 2009
Service Date:	October 1, 2009
Study Period:	20 years 0 months(October 1, 2009 through September 30, 2029
Discount Rate:	3%
Discounting Convention:	End-of-Year

Comparison of Present-Value Costs

PV Life-Cycle Cost

	Base Case	Alternative	Savings from Alternative
Initial Investment Costs:			
Capital Requirements as of Base Date	$1,026,390	$834,420	$191,970
Future Costs:			
Energy Consumption Costs	$1,577,707	$1,294,389	$283,318
Energy Demand Charges	$0	$0	$0
Energy Utility Rebates	$0	$0	$0
Water Costs	$0	$0	$0
Recurring and Non-Recurring OM&R Costs	$1,197,125	$1,297,310	-$100,184
Capital Replacements	$0	$49,000	-$49,000
Residual Value at End of Study Period	-$307,917	-$284,976	-$22,941
Subtotal (for Future Cost Items)	$2,466,915	$2,355,723	$111,193
Total PV Life-Cycle Cost	$3,493,305	$3,190,143	$303,163

Net Savings from Alternative Compared with Base Case

PV of Non-Investment Savings	$183,134
- Increased Total Investment	-$120,029
Net Savings	$303,163

NOTE: Meaningful SIR, AIRR and Payback can not be computed unless incremental savings and total savings are both positive

Energy Savings Summary

Energy Savings Summary (in stated units)

Energy	-----Average Annual Consumption-----	Life-Cycle

Energy Type	Average Base Case	Annual Alternative	Consumption Savings	Life-Cycle Savings
Electricity	1,116,806.0 kWh	1,281,863.0 kWh	-165,057.0 kWh	-3,300,688.1 kWh
Natural Gas	30,504.0 Therm	4,538.0 Therm	25,966.0 Therm	519,248.9 Therm

Energy Savings Summary (in MBtu)

Energy Type	-----Average Base Case	Annual Alternative	Consumption----- Savings	Life-Cycle Savings
Electricity	3,810.7 MBtu	4,373.9 MBtu	-563.2 MBtu	-11,262.4 MBtu
Natural Gas	3,050.4 MBtu	453.8 MBtu	2,596.6 MBtu	51,925.1 MBtu

Emissions Reduction Summary

Energy Type	-----Average Base Case	Annual Alternative	Emissions----- Reduction	Life-Cycle Reduction
Electricity				
CO2	1,169,004.27 kg	1,341,775.85 kg	-172,771.58 kg	-3,454,958.60 kg
SO2	2,164.97 kg	2,484.94 kg	-319.97 kg	-6,398.50 kg
NOx	2,356.34 kg	2,704.59 kg	-348.25 kg	-6,964.08 kg
Natural Gas				
CO2	161,132.92 kg	23,971.32 kg	137,161.60 kg	2,742,856.46 kg
SO2	1,300.39 kg	193.46 kg	1,106.94 kg	22,135.72 kg
NOx	135.19 kg	18.68 kg	116.51 kg	2,329.97 kg
Total:				
CO2	1,330,137.19 kg	1,365,747.18 kg	-35,609.98 kg	-712,102.14 kg
SO2	3,465.36 kg	2,678.39 kg	786.97 kg	15,737.22 kg
NOx	2,491.53 kg	2,723.26 kg	-231.74 kg	-4,634.12 kg

NIST BLCC 5.3-09: Comparative Analysis

Consistent with Federal Life Cycle Cost Methodology and Procedures, 10 CFR, Part 436, Subpart A

Base Case: 2003 IECC Base Case

Alternative: Alternative 30% Better

General Information

File Name:	C:\Program Files\BLCC5\projects\Residual Values\Large Big Box Retail 2WWR Norfolk Residual Value.xml
Date of Study:	Thu Oct 08 10:17:08 CDT 2009
Project Name:	Large Big Box Retail 2% WWR - Norfolk
Project Location:	Nebraska
Analysis Type:	FEMP Analysis, Energy Project
Analyst:	NR Decker
Base Date:	October 1, 2009
Service Date:	October 1, 2009
Study Period:	20 years 0 months(October 1, 2009 through September 30, 2029
Discount Rate:	3%
Discounting Convention:	End-of-Year

Comparison of Present-Value Costs

PV Life-Cycle Cost

	Base Case	Alternative	Savings from Alternative
Initial Investment Costs:			
Capital Requirements as of Base Date	$1,073,520	$857,420	$216,100
Future Costs:			
Energy Consumption Costs	$1,545,021	$1,415,188	$129,833
Energy Demand Charges	$0	$0	$0
Energy Utility Rebates	$0	$0	$0
Water Costs	$0	$0	$0
Recurring and Non-Recurring OM&R Costs	$1,140,861	$1,068,767	$72,093
Capital Replacements	$0	$57,000	-$57,000
Residual Value at End of Study Period	-$322,056	-$297,896	-$24,160
Subtotal (for Future Cost Items)	$2,363,825	$2,243,059	$120,766
Total PV Life-Cycle Cost	$3,437,345	$3,100,479	$336,866

Net Savings from Alternative Compared with Base Case

PV of Non-Investment Savings	$201,926
- Increased Total Investment	-$134,940
Net Savings	$336,866

NOTE: Meaningful SIR, AIRR and Payback can not be computed unless incremental savings and total savings are both positive

Energy Savings Summary

Energy Savings Summary (in stated units)

Energy	-----Average Annual Consumption-----	Life-Cycle

Energy Type	Average Base Case	Annual Alternative	Consumption Savings	Life-Cycle Savings
Electricity	1,058,250.0 kWh	1,320,109.0 kWh	-261,859.0 kWh	-5,236,463.1 kWh
Natural Gas	32,589.0 Therm	5,049.0 Therm	27,540.0 Therm	550,724.6 Therm

Energy Savings Summary (in MBtu)

Energy Type	-----Average Base Case	Annual Alternative	Consumption----- Savings	Life-Cycle Savings
Electricity	3,610.9 MBtu	4,504.4 MBtu	-893.5 MBtu	-17,867.5 MBtu
Natural Gas	3,258.9 MBtu	504.9 MBtu	2,754.0 MBtu	55,072.7 MBtu

Emissions Reduction Summary

Energy Type	-----Average Base Case	Annual Alternative	Emissions----- Reduction	Life-Cycle Reduction
Electricity				
CO2	1,107,711.43 kg	1,381,809.43 kg	-274,098.00 kg	-5,481,209.54 kg
SO2	2,051.45 kg	2,559.08 kg	-507.62 kg	-10,151.06 kg
NOx	2,232.79 kg	2,785.28 kg	-552.49 kg	-11,048.35 kg
Natural Gas				
CO2	172,146.63 kg	26,670.60 kg	145,476.02 kg	2,909,122.19 kg
SO2	1,389.28 kg	215.24 kg	1,174.04 kg	23,477.53 kg
NOx	144.43 kg	20.78 kg	123.65 kg	2,472.70 kg
Total:				
CO2	1,279,858.06 kg	1,408,480.03 kg	-128,621.98 kg	-2,572,087.35 kg
SO2	3,440.73 kg	2,774.32 kg	666.41 kg	13,326.47 kg
NOx	2,377.22 kg	2,806.06 kg	-428.84 kg	-8,575.66 kg

NIST BLCC 5.3-09: Comparative Analysis

Consistent with Federal Life Cycle Cost Methodology and Procedures, 10 CFR, Part 436, Subpart A

Base Case: 2003 IECC Base Case

Alternative: Alternative 30% Better

General Information

File Name:	C:\Program Files\BLCC5\projects\Residual Values\Large Big Box Retail 2WWR Chadron Residual Value.xml
Date of Study:	Thu Oct 08 10:18:10 CDT 2009
Project Name:	Large Big Box Retail 2% WWR - Chadron
Project Location:	Nebraska
Analysis Type:	FEMP Analysis, Energy Project
Analyst:	NR Decker
Base Date:	October 1, 2009
Service Date:	October 1, 2009
Study Period:	20 years 0 months(October 1, 2009 through September 30, 2029
Discount Rate:	3%
Discounting Convention:	End-of-Year

Comparison of Present-Value Costs

PV Life-Cycle Cost

	Base Case	Alternative	Savings from Alternative
Initial Investment Costs:			
Capital Requirements as of Base Date	$1,184,420	$803,420	$381,000
Future Costs:			
Energy Consumption Costs	$1,427,701	$1,299,232	$128,468
Energy Demand Charges	$0	$0	$0
Energy Utility Rebates	$0	$0	$0
Water Costs	$0	$0	$0
Recurring and Non-Recurring OM&R Costs	$1,025,188	$948,361	$76,827
Capital Replacements	$0	$47,000	-$47,000
Residual Value at End of Study Period	-$355,326	-$274,996	-$80,330
Subtotal (for Future Cost Items)	$2,097,563	$2,019,597	$77,965
Total PV Life-Cycle Cost	$3,281,983	$2,823,017	$458,965

Net Savings from Alternative Compared with Base Case

PV of Non-Investment Savings	$205,295
- Increased Total Investment	-$253,670
Net Savings	$458,965

NOTE: Meaningful SIR, AIRR and Payback can not be computed unless incremental savings and total savings are both positive

Energy Savings Summary

Energy Savings Summary (in stated units)

Energy	-----Average Annual Consumption-----	Life-Cycle

Energy Type	Average Base Case	Annual Alternative	Consumption Savings	Life-Cycle Savings
Electricity	1,009,747.0 kWh	1,231,836.0 kWh	-222,089.0 kWh	-4,441,172.0 kWh
Natural Gas	26,763.0 Therm	3,237.0 Therm	23,526.0 Therm	470,455.6 Therm

Energy Savings Summary (in MBtu)

Energy Type	-----Average Base Case	Annual Alternative	Consumption----- Savings	Life-Cycle Savings
Electricity	3,445.4 MBtu	4,203.2 MBtu	-757.8 MBtu	-15,153.9 MBtu
Natural Gas	2,676.3 MBtu	323.7 MBtu	2,352.6 MBtu	47,045.7 MBtu

Emissions Reduction Summary

Energy Type	-----Average Base Case	Annual Alternative	Emissions----- Reduction	Life-Cycle Reduction
Electricity				
CO2	1,056,941.45 kg	1,289,410.65 kg	-232,469.19 kg	-4,648,747.40 kg
SO2	1,957.43 kg	2,387.96 kg	-430.53 kg	-8,609.36 kg
NOx	2,130.45 kg	2,599.04 kg	-468.58 kg	-9,370.38 kg
Natural Gas				
CO2	141,371.64 kg	17,098.98 kg	124,272.66 kg	2,485,112.88 kg
SO2	1,140.91 kg	137.99 kg	1,002.92 kg	20,055.65 kg
NOx	118.61 kg	13.32 kg	105.29 kg	2,105.48 kg
Total:				
CO2	1,198,313.09 kg	1,306,509.63 kg	-108,196.54 kg	-2,163,634.53 kg
SO2	3,098.34 kg	2,525.95 kg	572.39 kg	11,446.28 kg
NOx	2,249.06 kg	2,612.36 kg	-363.29 kg	-7,264.89 kg

NIST BLCC 5.3-09: Comparative Analysis

Consistent with Federal Life Cycle Cost Methodology and Procedures, 10 CFR, Part 436, Subpart A

Base Case: 2003 IECC Base Case

Alternative: 30% Alternative Design

General Information

File Name:	J:\002-10106-000\E Design SD-DD-CD\05 Engineering Calculations\Mechanical\2009 10 01 FINAL SUBMITTAL DOCS\BLCC Files\Elementary 18WWR Omaha Residual Value.xm
Date of Study:	Thu Nov 05 13:41:34 CST 2009
Project Name:	Elementary 18% WWR - Omaha
Project Location:	Nebraska
Analysis Type:	FEMP Analysis, Energy Project
Analyst:	SM Cherney
Base Date:	October 1, 2009
Service Date:	October 1, 2009
Study Period:	20 years 0 months(October 1, 2009 through September 30, 2029
Discount Rate:	3%
Discounting Convention:	End-of-Year

Comparison of Present-Value Costs

PV Life-Cycle Cost

	Base Case	Alternative	Savings from Alternative
Initial Investment Costs:			
Capital Requirements as of Base Date	$558,615	$741,030	-$182,415
Future Costs:			
Energy Consumption Costs	$881,423	$609,927	$271,496
Energy Demand Charges	$0	$0	$0
Energy Utility Rebates	$0	$0	$0
Water Costs	$0	$0	$0
Recurring and Non-Recurring OM&R Costs	$782,682	$924,376	-$141,694
Capital Replacements	$240,500	$240,500	$0
Residual Value at End of Study Period	-$319,879	-$374,604	$54,725
Subtotal (for Future Cost Items)	$1,584,726	$1,400,199	$184,527
Total PV Life-Cycle Cost	$2,143,341	$2,141,229	$2,112

Net Savings from Alternative Compared with Base Case

PV of Non-Investment Savings	$129,802
- Increased Total Investment	$127,691
Net Savings	$2,112

Savings-to-Investment Ratio (SIR)

SIR = 1.02

Adjusted Internal Rate of Return

AIRR 3.02%

AIRR = 3.08%

Payback Period

Estimated Years to Payback (from beginning of Service Period)

Simple Payback occurs in year	20
Discounted Payback occurs in year	20

Energy Savings Summary

Energy Savings Summary (in stated units)

Energy Type	Average Annual Consumption Base Case	Alternative	Savings	Life-Cycle Savings
Electricity	769,399.0 kWh	568,060.0 kWh	201,339.0 kWh	4,026,228.8 kWh
Natural Gas	1,535.0 Therm	0.0 Therm	1,535.0 Therm	30,695.8 Therm

Energy Savings Summary (in MBtu)

Energy Type	Average Annual Consumption Base Case	Alternative	Savings	Life-Cycle Savings
Electricity	2,625.3 MBtu	1,938.3 MBtu	687.0 MBtu	13,738.1 MBtu
Natural Gas	153.5 MBtu	0.0 MBtu	153.5 MBtu	3,069.6 MBtu

Emissions Reduction Summary

Energy Type	Average Annual Emissions Base Case	Alternative	Reduction	Life-Cycle Reduction
Electricity				
CO2	805,359.86 kg	594,610.49 kg	210,749.36 kg	4,214,410.23 kg
SO2	1,491.51 kg	1,101.20 kg	390.30 kg	7,804.98 kg
NOx	1,623.35 kg	1,198.54 kg	424.80 kg	8,494.90 kg
Natural Gas				
CO2	8,108.41 kg	0.00 kg	8,108.41 kg	162,146.06 kg
SO2	65.44 kg	0.00 kg	65.44 kg	1,308.57 kg
NOx	6.32 kg	0.00 kg	6.32 kg	126.32 kg
Total:				
CO2	813,468.27 kg	594,610.49 kg	218,857.77 kg	4,376,556.29 kg
SO2	1,556.94 kg	1,101.20 kg	455.74 kg	9,113.55 kg
NOx	1,629.66 kg	1,198.54 kg	431.12 kg	8,621.22 kg

NIST BLCC 5.3-09: Comparative Analysis

Consistent with Federal Life Cycle Cost Methodology and Procedures, 10 CFR, Part 436, Subpart A

Base Case: 2003 IECC Base Case

Alternative: 30% Alternative Design

General Information

File Name:	J:\002-10106-000\E Design SD-DD-CD\05 Engineering Calculations\Mechanical\2009 10 01 FINAL SUBMITTAL DOCS\BLCC Files\Elementary 18WWR Norfolk Residual Value.xm
Date of Study:	Thu Nov 05 13:39:01 CST 2009
Project Name:	Elementary 18% WWR - Norfolk
Project Location:	Nebraska
Analysis Type:	FEMP Analysis, Energy Project
Analyst:	SM Cherney
Base Date:	October 1, 2009
Service Date:	October 1, 2009
Study Period:	20 years 0 months(October 1, 2009 through September 30, 2029
Discount Rate:	3%
Discounting Convention:	End-of-Year

Comparison of Present-Value Costs

PV Life-Cycle Cost

	Base Case	Alternative	Savings from Alternative
Initial Investment Costs:			
Capital Requirements as of Base Date	$527,630	$698,130	-$170,500
Future Costs:			
Energy Consumption Costs	$742,285	$535,439	$206,846
Energy Demand Charges	$0	$0	$0
Energy Utility Rebates	$0	$0	$0
Water Costs	$0	$0	$0
Recurring and Non-Recurring OM&R Costs	$745,896	$886,890	-$140,994
Capital Replacements	$229,196	$229,196	$0
Residual Value at End of Study Period	-$303,426	-$354,576	$51,150
Subtotal (for Future Cost Items)	$1,413,951	$1,296,949	$117,002
Total PV Life-Cycle Cost	$1,941,581	$1,995,079	-$53,498

Net Savings from Alternative Compared with Base Case

PV of Non-Investment Savings	$65,852
- Increased Total Investment	$119,350
Net Savings	-$53,498

Savings-to-Investment Ratio (SIR)

SIR = 0.55

SIR is lower than 1.0; project alternative is not cost effective.

Adjusted Internal Rate of Return

Adjusted Internal Rate of Return

AIRR = -0.02%

AIRR is lower than your discount rate; project alternative is not cost effective.

Payback Period

Estimated Years to Payback (from beginning of Service Period)

Discounted Payback never reached during study period.

Simple Payback occurs in year 20

Energy Savings Summary

Energy Savings Summary (in stated units)

Energy Type	Average Annual Consumption: Base Case	Alternative	Savings	Life-Cycle Savings
Electricity	771,978.0 kWh	562,433.0 kWh	209,545.0 kWh	4,190,326.3 kWh
Natural Gas	1,580.0 Therm	0.0 Therm	1,580.0 Therm	31,595.7 Therm

Energy Savings Summary (in MBtu)

Energy Type	Average Annual Consumption: Base Case	Alternative	Savings	Life-Cycle Savings
Electricity	2,634.1 MBtu	1,919.1 MBtu	715.0 MBtu	14,298.0 MBtu
Natural Gas	158.0 MBtu	0.0 MBtu	158.0 MBtu	3,159.6 MBtu

Emissions Reduction Summary

Energy Type	Average Annual Emissions: Base Case	Alternative	Reduction	Life-Cycle Reduction
Electricity				
CO2	808,059.40 kg	588,720.49 kg	219,338.90 kg	4,386,177.50 kg
SO2	1,496.51 kg	1,090.30 kg	406.21 kg	8,123.09 kg
NOx	1,628.79 kg	1,186.67 kg	442.12 kg	8,841.12 kg
Natural Gas				
CO2	8,346.12 kg	0.00 kg	8,346.12 kg	166,899.53 kg
SO2	67.36 kg	0.00 kg	67.36 kg	1,346.93 kg
NOx	6.50 kg	0.00 kg	6.50 kg	130.03 kg
Total:				
CO2	816,405.51 kg	588,720.49 kg	227,685.02 kg	4,553,077.03 kg
SO2	1,563.86 kg	1,090.30 kg	473.57 kg	9,470.02 kg
NOx	1,635.29 kg	1,186.67 kg	448.62 kg	8,971.15 kg

NIST BLCC 5.3-09: Comparative Analysis

Consistent with Federal Life Cycle Cost Methodology and Procedures, 10 CFR, Part 436, Subpart A

Base Case: 2003 IECC Base Case

Alternative: 30% Alternative Design

General Information

File Name:	J:\002-10106-000\E Design SD-DD-CD\05 Engineering Calculations\Mechanical\2009 10 01 FINAL SUBMITTAL DOCS\BLCC Files\Elementary 18WWR Chadron Residual Value.xm
Date of Study:	Thu Nov 05 13:33:01 CST 2009
Project Name:	Elementary 18% WWR - Chadron
Project Location:	Nebraska
Analysis Type:	FEMP Analysis, Energy Project
Analyst:	SM Cherney
Base Date:	October 1, 2009
Service Date:	October 1, 2009
Study Period:	20 years 0 months(October 1, 2009 through September 30, 2029
Discount Rate:	3%
Discounting Convention:	End-of-Year

Comparison of Present-Value Costs

PV Life-Cycle Cost

	Base Case	Alternative	Savings from Alternative
Initial Investment Costs:			
Capital Requirements as of Base Date	$502,930	$673,430	-$170,500
Future Costs:			
Energy Consumption Costs	$603,999	$473,458	$130,541
Energy Demand Charges	$0	$0	$0
Energy Utility Rebates	$0	$0	$0
Water Costs	$0	$0	$0
Recurring and Non-Recurring OM&R Costs	$691,063	$812,526	-$121,463
Capital Replacements	$211,399	$211,399	$0
Residual Value at End of Study Period	-$284,746	-$335,896	$51,150
Subtotal (for Future Cost Items)	$1,221,715	$1,161,487	$60,228
Total PV Life-Cycle Cost	$1,724,645	$1,834,917	-$110,272

Net Savings from Alternative Compared with Base Case

PV of Non-Investment Savings	$9,078
- Increased Total Investment	$119,350
Net Savings	-$110,272

Savings-to-Investment Ratio (SIR)

SIR = 0.08

SIR is lower than 1.0; project alternative is not cost effective.

Adjusted Internal Rate of Return

Adjusted Internal Rate of Return

AIRR = -9.45%

AIRR is lower than your discount rate; project alternative is not cost effective.

Payback Period

Estimated Years to Payback (from beginning of Service Period)

Simple Payback never reached during study period.

Discounted Payback never reached during study period.

Energy Savings Summary

Energy Savings Summary (in stated units)

Energy Type	Average Annual Consumption: Base Case	Alternative	Savings	Life-Cycle Savings
Electricity	623,655.0 kWh	498,133.0 kWh	125,522.0 kWh	2,510,096.3 kWh
Natural Gas	1,574.0 Therm	0.0 Therm	1,574.0 Therm	31,475.7 Therm

Energy Savings Summary (in MBtu)

Energy Type	Average Annual Consumption: Base Case	Alternative	Savings	Life-Cycle Savings
Electricity	2,128.0 MBtu	1,699.7 MBtu	428.3 MBtu	8,564.8 MBtu
Natural Gas	157.4 MBtu	0.0 MBtu	157.4 MBtu	3,147.6 MBtu

Emissions Reduction Summary

Energy Type	Average Annual Emissions: Base Case	Alternative	Reduction	Life-Cycle Reduction
Electricity				
CO2	652,803.94 kg	521,415.18 kg	131,388.76 kg	2,627,415.46 kg
SO2	1,208.98 kg	965.65 kg	243.33 kg	4,865.91 kg
NOx	1,315.84 kg	1,051.01 kg	264.84 kg	5,296.02 kg
Natural Gas				
CO2	8,314.42 kg	0.00 kg	8,314.42 kg	166,265.73 kg
SO2	67.10 kg	0.00 kg	67.10 kg	1,341.82 kg
NOx	6.48 kg	0.00 kg	6.48 kg	129.53 kg
Total:				
CO2	661,118.37 kg	521,415.18 kg	139,703.18 kg	2,793,681.19 kg
SO2	1,276.08 kg	965.65 kg	310.43 kg	6,207.72 kg
NOx	1,322.32 kg	1,051.01 kg	271.31 kg	5,425.56 kg

NIST BLCC 5.3-09: Comparative Analysis

Consistent with Federal Life Cycle Cost Methodology and Procedures, 10 CFR, Part 436, Subpart A

Base Case: 2003 IECC Base Case

Alternative: Alternative 30% Better

General Information

File Name:	C:\Program Files\BLCC5\projects\Residual Values\Secondary School 18WWR Omaha Residual Value.xml
Date of Study:	Fri Oct 16 16:36:27 CDT 2009
Project Name:	Secondary School 18% WWR - Omaha
Project Location:	Nebraska
Analysis Type:	FEMP Analysis, Energy Project
Analyst:	NR Decker
Base Date:	October 1, 2009
Service Date:	October 1, 2009
Study Period:	20 years 0 months(October 1, 2009 through September 30, 2029
Discount Rate:	3%
Discounting Convention:	End-of-Year

Comparison of Present-Value Costs

PV Life-Cycle Cost

	Base Case	Alternative	Savings from Alternative
Initial Investment Costs:			
Capital Requirements as of Base Date	$1,115,914	$1,135,488	-$19,574
Future Costs:			
Energy Consumption Costs	$1,261,670	$919,391	$342,279
Energy Demand Charges	$0	$0	$0
Energy Utility Rebates	$0	$0	$0
Water Costs	$0	$0	$0
Recurring and Non-Recurring OM&R Costs	$885,829	$1,781,733	-$895,904
Capital Replacements	$0	$309,400	-$309,400
Residual Value at End of Study Period	-$334,774	-$547,372	$212,598
Subtotal (for Future Cost Items)	$1,812,725	$2,463,152	-$650,427
Total PV Life-Cycle Cost	$2,928,638	$3,598,640	-$670,001

Net Savings from Alternative Compared with Base Case

PV of Non-Investment Savings	-$553,625
- Increased Total Investment	$116,376
Net Savings	-$670,001

NOTE: Meaningful SIR, AIRR and Payback can not be computed unless incremental savings and total savings are both positive

Energy Savings Summary

Energy Savings Summary (in stated units)

Energy	-----Average Annual Consumption-----	Life-Cycle

Energy Type	Average Base Case	Annual Alternative	Consumption Savings	Life-Cycle Savings
Electricity	1,129,525.0 kWh	847,767.0 kWh	281,758.0 kWh	5,634,388.6 kWh
Natural Gas	3,095.0 Therm	0.0 Therm	3,095.0 Therm	61,891.5 Therm

Energy Savings Summary (in MBtu)

Energy Type	-----Average Base Case	Annual Alternative	Consumption----- Savings	Life-Cycle Savings
Electricity	3,854.1 MBtu	2,892.7 MBtu	961.4 MBtu	19,225.3 MBtu
Natural Gas	309.5 MBtu	0.0 MBtu	309.5 MBtu	6,189.2 MBtu

Emissions Reduction Summary

Energy Type	-----Average Base Case	Annual Alternative	Emissions----- Reduction	Life-Cycle Reduction
Electricity				
CO2	1,182,317.75 kg	887,390.69 kg	294,927.06 kg	5,897,733.66 kg
SO2	2,189.62 kg	1,643.43 kg	546.20 kg	10,922.45 kg
NOx	2,383.17 kg	1,788.69 kg	594.48 kg	11,887.93 kg
Natural Gas				
CO2	16,348.89 kg	0.00 kg	16,348.89 kg	326,932.94 kg
SO2	131.94 kg	0.00 kg	131.94 kg	2,638.45 kg
NOx	12.74 kg	0.00 kg	12.74 kg	254.70 kg
Total:				
CO2	1,198,666.63 kg	887,390.69 kg	311,275.94 kg	6,224,666.60 kg
SO2	2,321.56 kg	1,643.43 kg	678.14 kg	13,560.91 kg
NOx	2,395.91 kg	1,788.69 kg	607.21 kg	12,142.64 kg

NIST BLCC 5.3-09: Comparative Analysis

Consistent with Federal Life Cycle Cost Methodology and Procedures, 10 CFR, Part 436, Subpart A

Base Case: 2003 IECC Base Case

Alternative: Alternative 30% Better

General Information

File Name:	C:\Program Files\BLCC5\projects\Residual Values\Secondary School 18WWR Norfolk Residual Value.xml
Date of Study:	Fri Oct 16 16:32:35 CDT 2009
Project Name:	Secondary School 18% WWR - Norfolk
Project Location:	Nebraska
Analysis Type:	FEMP Analysis, Energy Project
Analyst:	NR Decker
Base Date:	October 1, 2009
Service Date:	October 1, 2009
Study Period:	20 years 0 months(October 1, 2009 through September 30, 2029
Discount Rate:	3%
Discounting Convention:	End-of-Year

Comparison of Present-Value Costs

PV Life-Cycle Cost

	Base Case	Alternative	Savings from Alternative
Initial Investment Costs:			
Capital Requirements as of Base Date	$1,059,304	$1,050,988	$8,316
Future Costs:			
Energy Consumption Costs	$1,113,794	$814,616	$299,178
Energy Demand Charges	$0	$0	$0
Energy Utility Rebates	$0	$0	$0
Water Costs	$0	$0	$0
Recurring and Non-Recurring OM&R Costs	$702,307	$1,552,363	-$850,057
Capital Replacements	$0	$235,300	-$235,300
Residual Value at End of Study Period	-$317,791	-$449,079	$131,288
Subtotal (for Future Cost Items)	$1,498,309	$2,153,200	-$654,890
Total PV Life-Cycle Cost	$2,557,614	$3,204,188	-$646,574

Net Savings from Alternative Compared with Base Case

PV of Non-Investment Savings	-$550,878
- Increased Total Investment	$95,695
Net Savings	-$646,574

NOTE: Meaningful SIR, AIRR and Payback can not be computed unless incremental savings and total savings are both positive

Energy Savings Summary

Energy Savings Summary (in stated units)

Energy	-----Average Annual Consumption-----	Life-Cycle

Energy Type	Average Base Case	Annual Alternative	Consumption Savings	Life-Cycle Savings
Electricity	1,129,818.0 kWh	839,385.0 kWh	290,433.0 kWh	5,807,864.8 kWh
Natural Gas	3,154.0 Therm	0.0 Therm	3,154.0 Therm	63,071.4 Therm

Energy Savings Summary (in MBtu)

Energy Type	-----Average Base Case	Annual Alternative	Consumption----- Savings	Life-Cycle Savings
Electricity	3,855.1 MBtu	2,864.1 MBtu	991.0 MBtu	19,817.3 MBtu
Natural Gas	315.4 MBtu	0.0 MBtu	315.4 MBtu	6,307.2 MBtu

Emissions Reduction Summary

Energy Type	-----Average Base Case	Annual Alternative	Emissions----- Reduction	Life-Cycle Reduction
Electricity				
CO2	1,182,624.44 kg	878,616.92 kg	304,007.52 kg	6,079,318.00 kg
SO2	2,190.19 kg	1,627.18 kg	563.01 kg	11,258.74 kg
NOx	2,383.79 kg	1,771.01 kg	612.78 kg	12,253.95 kg
Natural Gas				
CO2	16,660.54 kg	0.00 kg	16,660.54 kg	333,165.26 kg
SO2	134.46 kg	0.00 kg	134.46 kg	2,688.75 kg
NOx	12.98 kg	0.00 kg	12.98 kg	259.56 kg
Total:				
CO2	1,199,284.98 kg	878,616.92 kg	320,668.06 kg	6,412,483.26 kg
SO2	2,324.65 kg	1,627.18 kg	697.47 kg	13,947.49 kg
NOx	2,396.77 kg	1,771.01 kg	625.76 kg	12,513.51 kg

NIST BLCC 5.3-09: Comparative Analysis

Consistent with Federal Life Cycle Cost Methodology and Procedures, 10 CFR, Part 436, Subpart A

Base Case: 2003 IECC Base Case

Alternative: Alternative 30% Better

General Information

File Name:	C:\Program Files\BLCC5\projects\Residual Values\Secondary School 18WWR Chadron Residual Value.xml
Date of Study:	Fri Oct 16 16:22:37 CDT 2009
Project Name:	Secondary School 18% WWR - Chadron
Project Location:	Nebraska
Analysis Type:	FEMP Analysis, Energy Project
Analyst:	NR Decker
Base Date:	October 1, 2009
Service Date:	October 1, 2009
Study Period:	20 years 0 months(October 1, 2009 through September 30, 2029
Discount Rate:	3%
Discounting Convention:	End-of-Year

Comparison of Present-Value Costs

PV Life-Cycle Cost

	Base Case	Alternative	Savings from Alternative
Initial Investment Costs:			
Capital Requirements as of Base Date	$1,035,804	$1,084,788	-$48,984
Future Costs:			
Energy Consumption Costs	$992,862	$763,946	$228,917
Energy Demand Charges	$0	$0	$0
Energy Utility Rebates	$0	$0	$0
Water Costs	$0	$0	$0
Recurring and Non-Recurring OM&R Costs	$719,712	$1,505,527	-$785,815
Capital Replacements	$0	$265,200	-$265,200
Residual Value at End of Study Period	-$310,741	-$488,976	$178,235
Subtotal (for Future Cost Items)	$1,401,833	$2,045,696	-$643,863
Total PV Life-Cycle Cost	$2,437,637	$3,130,484	-$692,847

Net Savings from Alternative Compared with Base Case

PV of Non-Investment Savings	-$556,898
- Increased Total Investment	$135,948
Net Savings	-$692,847

NOTE: Meaningful SIR, AIRR and Payback can not be computed unless incremental savings and total savings are both positive

Energy Savings Summary

Energy Savings Summary (in stated units)

Energy	-----Average Annual Consumption-----	Life-Cycle

Energy Type	Average Base Case	Annual Alternative	Consumption Savings	Life-Cycle Savings
Electricity	993,452.0 kWh	780,976.0 kWh	212,476.0 kWh	4,248,938.3 kWh
Natural Gas	3,150.0 Therm	0.0 Therm	3,150.0 Therm	62,991.4 Therm

Energy Savings Summary (in MBtu)

Energy Type	-----Average Base Case	Annual Alternative	Consumption----- Savings	Life-Cycle Savings
Electricity	3,389.8 MBtu	2,664.8 MBtu	725.0 MBtu	14,498.0 MBtu
Natural Gas	315.0 MBtu	0.0 MBtu	315.0 MBtu	6,299.2 MBtu

Emissions Reduction Summary

Energy Type	-----Average Base Case	Annual Alternative	Emissions----- Reduction	Life-Cycle Reduction
Electricity				
CO2	1,039,884.84 kg	817,477.95 kg	222,406.89 kg	4,447,528.93 kg
SO2	1,925.84 kg	1,513.95 kg	411.89 kg	8,236.71 kg
NOx	2,096.07 kg	1,647.77 kg	448.30 kg	8,964.79 kg
Natural Gas				
CO2	16,639.41 kg	0.00 kg	16,639.41 kg	332,742.73 kg
SO2	134.29 kg	0.00 kg	134.29 kg	2,685.34 kg
NOx	12.96 kg	0.00 kg	12.96 kg	259.23 kg
Total:				
CO2	1,056,524.26 kg	817,477.95 kg	239,046.31 kg	4,780,271.67 kg
SO2	2,060.13 kg	1,513.95 kg	546.18 kg	10,922.05 kg
NOx	2,109.04 kg	1,647.77 kg	461.26 kg	9,224.02 kg

NIST BLCC 5.3-09: Comparative Analysis

Consistent with Federal Life Cycle Cost Methodology and Procedures, 10 CFR, Part 436, Subpart A

Base Case: 2003 IECC Base Case

Alternative: 30% Alternative Design

General Information

File Name:	C:\Program Files (x86)\BLCC5\projects\Warehouse WWR Omaha Residual Value.xml
Date of Study:	Mon Oct 05 13:37:31 CDT 2009
Project Name:	Warehouse WWR - Omaha
Project Location:	Nebraska
Analysis Type:	FEMP Analysis, Energy Project
Analyst:	SM Cherney
Base Date:	October 1, 2009
Service Date:	October 1, 2009
Study Period:	20 years 0 months(October 1, 2009 through September 30, 2029)
Discount Rate:	3%
Discounting Convention:	End-of-Year

Comparison of Present-Value Costs

PV Life-Cycle Cost

	Base Case	Alternative	Savings from Alternative
Initial Investment Costs:			
Capital Requirements as of Base Date	$200,341	$397,980	-$197,639
Future Costs:			
Energy Consumption Costs	$327,111	$254,692	$72,419
Energy Demand Charges	$0	$0	$0
Energy Utility Rebates	$0	$0	$0
Water Costs	$0	$0	$0
Recurring and Non-Recurring OM&R Costs	$210,589	$205,963	$4,626
Capital Replacements	$14,500	$16,000	-$1,500
Residual Value at End of Study Period	-$68,877	-$129,924	$61,047
Subtotal (for Future Cost Items)	$483,323	$346,731	$136,592
Total PV Life-Cycle Cost	$683,664	$744,711	-$61,048

Net Savings from Alternative Compared with Base Case

PV of Non-Investment Savings	$77,045
- Increased Total Investment	$138,092
Net Savings	-$61,048

Savings-to-Investment Ratio (SIR)

SIR = 0.56

SIR is lower than 1.0; project alternative is not cost effective.

Adjusted Internal Rate of Return

AIRR = 0.04%

AIRR is lower than your discount rate; project alternative is not cost effective.

Payback Period

Estimated Years to Payback (from beginning of Service Period)

Discounted Payback never reached during study period.

Simple Payback occurs in year 20

Energy Savings Summary

Energy Savings Summary (in stated units)

Energy Type	Average Annual Consumption Base Case	Alternative	Savings	Life-Cycle Savings
Electricity	217,351.0 kWh	201,700.0 kWh	15,651.0 kWh	312,977.1 kWh
Natural Gas	6,757.0 Therm	3,025.0 Therm	3,732.0 Therm	74,629.8 Therm

Energy Savings Summary (in MBtu)

Energy Type	Average Annual Consumption Base Case	Alternative	Savings	Life-Cycle Savings
Electricity	741.6 MBtu	688.2 MBtu	53.4 MBtu	1,067.9 MBtu
Natural Gas	675.7 MBtu	302.5 MBtu	373.2 MBtu	7,463.0 MBtu

Emissions Reduction Summary

Energy Type	Average Annual Emissions Base Case	Alternative	Reduction	Life-Cycle Reduction
Electricity				
CO2	227,509.74 kg	211,127.23 kg	16,382.51 kg	327,605.35 kg
SO2	421.34 kg	391.00 kg	30.34 kg	606.72 kg
NOx	458.59 kg	425.56 kg	33.02 kg	660.35 kg
Natural Gas				
CO2	35,692.86 kg	15,979.12 kg	19,713.74 kg	394,220.92 kg
SO2	288.05 kg	128.96 kg	159.10 kg	3,181.49 kg
NOx	27.81 kg	12.45 kg	15.36 kg	307.12 kg
Total:				
CO2	263,202.61 kg	227,106.35 kg	36,096.25 kg	721,826.27 kg
SO2	709.40 kg	519.96 kg	189.44 kg	3,788.20 kg
NOx	486.39 kg	438.01 kg	48.38 kg	967.47 kg

NIST BLCC 5.3-09: Comparative Analysis

Consistent with Federal Life Cycle Cost Methodology and Procedures, 10 CFR, Part 436, Subpart A

Base Case: 2003 IECC Base Case

Alternative: 30% Alternative Design

General Information

File Name:	C:\Program Files (x86)\BLCC5\projects\Completed\Warehouse WWR Norfolk Residual Value.xml
Date of Study:	Mon Oct 05 15:20:16 CDT 2009
Project Name:	Warehouse WWR - Norfolk
Project Location:	Nebraska
Analysis Type:	FEMP Analysis, Energy Project
Analyst:	SM Cherney
Base Date:	October 1, 2009
Service Date:	October 1, 2009
Study Period:	20 years 0 months(October 1, 2009 through September 30, 2029
Discount Rate:	3%
Discounting Convention:	End-of-Year

Comparison of Present-Value Costs

PV Life-Cycle Cost

	Base Case	Alternative	Savings from Alternative
Initial Investment Costs:			
Capital Requirements as of Base Date	$214,280	$397,980	-$183,700
Future Costs:			
Energy Consumption Costs	$334,533	$258,368	$76,164
Energy Demand Charges	$0	$0	$0
Energy Utility Rebates	$0	$0	$0
Water Costs	$0	$0	$0
Recurring and Non-Recurring OM&R Costs	$200,691	$196,283	$4,408
Capital Replacements	$13,818	$15,248	-$1,430
Residual Value at End of Study Period	-$72,647	-$129,429	$56,783
Subtotal (for Future Cost Items)	$476,396	$340,470	$135,926
Total PV Life-Cycle Cost	$690,676	$738,450	-$47,774

Net Savings from Alternative Compared with Base Case

PV of Non-Investment Savings	$80,573
- Increased Total Investment	$128,347
Net Savings	-$47,774

Savings-to-Investment Ratio (SIR)

SIR = 0.63

SIR is lower than 1.0; project alternative is not cost effective.

Adjusted Internal Rate of Return

Adjusted Internal Rate of Return

AIRR = 0.63%

AIRR is lower than your discount rate; project alternative is not cost effective.

Payback Period

Estimated Years to Payback (from beginning of Service Period)

Discounted Payback never reached during study period.

Simple Payback occurs in year 20

Energy Savings Summary

Energy Savings Summary (in stated units)

Energy Type	Average Annual Consumption – Base Case	Alternative	Savings	Life-Cycle Savings
Electricity	217,497.0 kWh	202,052.0 kWh	15,445.0 kWh	308,857.7 kWh
Natural Gas	8,025.0 Therm	3,637.0 Therm	4,388.0 Therm	87,748.0 Therm

Energy Savings Summary (in MBtu)

Energy Type	Average Annual Consumption – Base Case	Alternative	Savings	Life-Cycle Savings
Electricity	742.1 MBtu	689.4 MBtu	52.7 MBtu	1,053.9 MBtu
Natural Gas	802.5 MBtu	363.7 MBtu	438.8 MBtu	8,774.8 MBtu

Emissions Reduction Summary

Energy Type	Average Annual Emissions – Base Case	Alternative	Reduction	Life-Cycle Reduction
Electricity				
CO2	227,662.57 kg	211,495.69 kg	16,166.88 kg	323,293.38 kg
SO2	421.63 kg	391.68 kg	29.94 kg	598.73 kg
NOx	458.89 kg	426.31 kg	32.59 kg	651.66 kg
Natural Gas				
CO2	42,390.89 kg	19,211.92 kg	23,178.97 kg	463,515.91 kg
SO2	342.11 kg	155.05 kg	187.06 kg	3,740.72 kg
NOx	33.03 kg	14.97 kg	18.06 kg	361.11 kg
Total:				
CO2	270,053.46 kg	230,707.61 kg	39,345.85 kg	786,809.29 kg
SO2	763.73 kg	546.73 kg	217.00 kg	4,339.45 kg
NOx	491.92 kg	441.27 kg	50.65 kg	1,012.76 kg

NIST BLCC 5.3-09: Comparative Analysis

Consistent with Federal Life Cycle Cost Methodology and Procedures, 10 CFR, Part 436, Subpart A

Base Case: 2003 IECC Base Case

Alternative: 30% Alternative Design

General Information

File Name:	C:\Program Files (x86)\BLCC5\projects\Completed\Warehouse WWR Chadron Residual Value.xml
Date of Study:	Mon Oct 05 13:59:35 CDT 2009
Project Name:	Warehouse WWR - Chadron
Project Location:	Nebraska
Analysis Type:	FEMP Analysis, Energy Project
Analyst:	SM Cherney
Base Date:	October 1, 2009
Service Date:	October 1, 2009
Study Period:	20 years 0 months(October 1, 2009 through September 30, 2029
Discount Rate:	3%
Discounting Convention:	End-of-Year

Comparison of Present-Value Costs

PV Life-Cycle Cost

	Base Case	Alternative	Savings from Alternative
Initial Investment Costs:			
Capital Requirements as of Base Date	$214,280	$397,980	-$183,700
Future Costs:			
Energy Consumption Costs	$312,573	$245,481	$67,091
Energy Demand Charges	$0	$0	$0
Energy Utility Rebates	$0	$0	$0
Water Costs	$0	$0	$0
Recurring and Non-Recurring OM&R Costs	$185,107	$181,042	$4,066
Capital Replacements	$12,746	$14,064	-$1,318
Residual Value at End of Study Period	-$71,997	-$128,650	$56,653
Subtotal (for Future Cost Items)	$438,429	$311,937	$126,491
Total PV Life-Cycle Cost	$652,709	$709,917	-$57,209

Net Savings from Alternative Compared with Base Case

PV of Non-Investment Savings	$71,157
- Increased Total Investment	$128,366
Net Savings	-$57,209

Savings-to-Investment Ratio (SIR)

SIR = 0.55

SIR is lower than 1.0; project alternative is not cost effective.

Adjusted Internal Rate of Return

Adjusted Internal Rate of Return

AIRR = 0.01%

AIRR is lower than your discount rate; project alternative is not cost effective.

Payback Period

Estimated Years to Payback (from beginning of Service Period)

Discounted Payback never reached during study period.

Simple Payback occurs in year 20

Energy Savings Summary

Energy Savings Summary (in stated units)

Energy Type	Average Base Case	Annual Alternative	Consumption Savings	Life-Cycle Savings
Electricity	216,764.0 kWh	201,729.0 kWh	15,035.0 kWh	300,658.8 kWh
Natural Gas	6,420.0 Therm	2,835.0 Therm	3,585.0 Therm	71,690.2 Therm

Energy Savings Summary (in MBtu)

Energy Type	Average Base Case	Annual Alternative	Consumption Savings	Life-Cycle Savings
Electricity	739.6 MBtu	688.3 MBtu	51.3 MBtu	1,025.9 MBtu
Natural Gas	642.0 MBtu	283.5 MBtu	358.5 MBtu	7,169.0 MBtu

Emissions Reduction Summary

Energy Type	Average Base Case	Annual Alternative	Emissions Reduction	Life-Cycle Reduction
Electricity				
CO2	226,895.31 kg	211,157.59 kg	15,737.72 kg	314,711.30 kg
SO2	420.20 kg	391.06 kg	29.15 kg	582.84 kg
NOx	457.35 kg	425.63 kg	31.72 kg	634.36 kg
Natural Gas				
CO2	33,912.71 kg	14,975.47 kg	18,937.24 kg	378,692.92 kg
SO2	273.69 kg	120.86 kg	152.83 kg	3,056.17 kg
NOx	26.42 kg	11.67 kg	14.75 kg	295.03 kg
Total:				
CO2	260,808.02 kg	226,133.06 kg	34,674.96 kg	693,404.22 kg
SO2	693.89 kg	511.92 kg	181.98 kg	3,639.01 kg
NOx	483.77 kg	437.29 kg	46.48 kg	929.38 kg

Nebraska Climate Zone Comparison Chart

Zone 13b (2003 IECC) .vs. Zone 5 (2006 IECC)

Component	2003 IECC	2006 IECC	Notes
Envelope			
Wall	*0-10%*; R-13 *10.1-25%*; R-13 *25.1-40%*; R-13 *40.1-50%;* R-13	R-13 + R-3.8 c.i., U-Value = 0.084	Metal Framed c.i. = Continuous Insulation #-#% = Window to Wall Ratio (WWR)
Roof	Metal Joist/Truss *0-10%*; R-19 c.i. *10.1-25%*; R-20 c.i. *25.1-40%*; R-24 c.i. *40.1-50%;* R-24 c.i.	Insulation Entirely Above Deck R-20 U-Value = 0.048	
Window; WWR% shown	*0-10%*; U=Any, SHGC=Any *10.1-25%*; U=0.50, SHGC=0.50 *25.1-40%*; U=0.50, SHGC=0.40 *40.1-50%;* U=0.40, SHGC=0.40	40% Max of Above Grade Wall, Metal Framing with/without thermal breaks *Curtain Wall/Storefront;* U=0.45, SHGC=0.40 *Entrance Door*; U=0.80, SHGC=0.40 *All Other;* U=0.55, SHGC=0.40	SHGC = Solar Heat Gain Coefficient Assuming PF < 0.25
Lighting	Space Dependent	Space Dependent	
HVAC System	Unitary A/Cs, cond. units, and Heat Pumps	Unitary A/Cs, cond. units, and Heat Pumps	
Cooling Efficiency	Same	Same	No changes to code
Heating Efficiency	Same	Same	No changes to code

Nebraska Climate Zone Comparison Chart

Zone 14b (2003 IECC) .vs. Zone 5 (2006 IECC)

Component	2003 IECC	2006 IECC	Notes
Envelope			
Wall	*0-10%*; R-13 + R-3 c.i. *10.1-25%*; R-13 + R-3 c.i. *25.1-40%*; R-13 + R-3 c.i. *40.1-50%;* R-13 + R-7 c.i.	R-13 + R-3.8 c.i., U-Value = 0.084	Metal Framed c.i. = Continuous Insulation #-#% = Window to Wall Ratio (WWR)
Roof	Metal Joist/Truss *0-10%*; R-20 c.i. *10.1-25%*; R-20 c.i. *25.1-40%*; R-24 c.i. *40.1-50%;* R-24 c.i.	Insulation Entirely Above Deck R-20 U-Value = 0.048	
Window; WWR% shown	*0-10%*; U=0.7, SHGC=Any *10.1-25%*; U=0.50, SHGC=0.50 *25.1-40%*; U=0.50, SHGC=0.40 *40.1-50%;* U=0.40, SHGC=0.40	40% Max of Above Grade Wall, Metal Framing with/without thermal breaks *Curtain Wall/Storefront;* U=0.45, SHGC=0.40 *Entrance Door*; U=0.80, SHGC=0.40 *All Other;* U=0.55, SHGC=0.40	SHGC = Solar Heat Gain Coefficient Assuming PF < 0.25
Lighting	Space Dependent	Space Dependent	
HVAC System	Unitary A/Cs, cond. units, and Heat Pumps	Unitary A/Cs, cond. units, and Heat Pumps	
Cooling Efficiency	Same	Same	No changes to code
Heating Efficiency	Same	Same	No changes to code

Nebraska Climate Zone Comparison Chart

Zone 15 (2003 IECC) .vs. Zone 5 (2006 IECC)

Component	2003 IECC	2006 IECC	Notes
Envelope			
Wall	*0-10%*; R-13 + R-3 c.i. *10.1-25%*; R-13 + R-3 c.i. *25.1-40%*; R-13 + R-3 c.i. *40.1-50%;* R-13 + R-7 c.i.	R-13 + R-3.8 c.i., U-Value = 0.084	Metal Framed c.i. = Continuous Insulation #-#% = Window to Wall Ratio (WWR)
Roof	Metal Joist/Truss *0-10%*; R-20 c.i. *10.1-25%*; R-20 c.i. *25.1-40%*; R-24 c.i. *40.1-50%;* R-24 c.i.	Insulation Entirely Above Deck R-20 U-Value = 0.048	
Window; WWR% shown	*0-10%*; U=0.7, SHGC=Any *10.1-25%*; U=0.50, SHGC=0.50 *25.1-40%*; U=0.50, SHGC=0.40 *40.1-50%;* U=0.40, SHGC=0.40	40% Max of Above Grade Wall, Metal Framing with/without thermal breaks *Curtain Wall/Storefront;* U=0.45, SHGC=0.40 *Entrance Door*; U=0.80, SHGC=0.40 *All Other;* U=0.55, SHGC=0.40	SHGC = Solar Heat Gain Coefficient Assuming PF < 0.25
Lighting	Space Dependent	Space Dependent	
HVAC System	Unitary A/Cs, cond. units, and Heat Pumps	Unitary A/Cs, cond. units, and Heat Pumps	
Cooling Efficiency	Same	Same	No changes to code
Heating Efficiency	Same	Same	No changes to code

Nebraska Climate Zone Comparison Chart

Zone 13b (2003 IECC) .vs. Zone 5 (ASHRAE Std. 90.1-2004)

Component	2003 IECC	ASHRAE 90.1-2004 Baseline Building	Notes
Envelope			
Wall	Metal framing *0-10%*; R-13 *10.1-25%*; R-13 *25.1-40%*; R-13	R-13 + R-3.8 ci, steel framed U-Value = 0.084	ci = Continuous Insulation
Roof	*0-10%*; R-19 c.i. *10.1-25%*; R-20 c.i. *25.1-40%*; R-24 c.i.	R-15 Entirely above deck U-Value = 0.063	
Window; WWR% shown	Assuming PF < 0.25 *0-10%*; U=Any, SHGC=Any *10.1-25%*; U=0.5, SHGC=0.5 *25.1-40%*; U=0.5, SHGC=0.4	*0-10%*; U=0.57, SHGC=0.49 *10.1-40%*; U=0.57, SHGC=0.39	SHGC = Solar Heat Gain Coefficient
Lighting	1.2 W/sf	1.2 W/sf	
HVAC System	Unitary A/Cs, cond. units, and Heat Pumps	Unitary A/Cs, cond. units, and Heat Pumps	
Cooling Efficiency	<65kBtuh: Split-10 SEER <65kBtuh: SP-9.7 SEER	<65kBtuh: Split-12 SEER <65kBtuh: SP-12 SEER	90.1-2004 provides both electric and non-electric heating efficiencies (03 IECC does not). It also provides a few other configurations.
Heating Efficiency	<65kBtuh: Split-6.8 HSPF <65kBtuh: SP-6.6 HSPF	<65kBtuh: Split-7.4 HSPF <65kBtuh: SP-7.4 HSPF	90.1-2004 provides ratings for 47/43F and 17/15F ambient (03 IECC only provides 47/43)

Nebraska Climate Zone Comparison Chart

LEO A DALY

Zone 14b (2003 IECC) .vs. Zone 5 (ASHRAE Std. 90.1-2004)

Component	2003 IECC	ASHRAE 90.1-2004 Baseline Building	Notes
Envelope			
Wall	Metal framing *0-10%*; R-13 + R-3 ci *10.1-25%*; R-13 + R-3 ci *25.1-40%*; R-13 + R-7 ci	R-13 + R-3.8 ci, steel framed U-Value = 0.084	ci = Continuous Insulation
Roof	*0-10%*; R-20 ci *10.1-25%*; R-20 ci *25.1-40%*; R-24 ci	R-15 Entirely above deck U-Value = 0.063	
Window; WWR% shown	Assuming PF < 0.25 *0-10%*; U=0.7, SHGC=Any *10.1-25%*; U=0.5, SHGC=0.5 *25.1-40%*; U=0.5, SHGC=0.4	*0-10%*; U=0.57, SHGC=0.49 *10.1-40%*; U=0.57, SHGC=0.39	SHGC = Solar Heat Gain Coefficient
Lighting	1.2 W/sf	1.2 W/sf	
HVAC System	Unitary A/Cs, cond. units, and Heat Pumps	Unitary A/Cs, cond. units, and Heat Pumps	
Cooling Efficiency	<65kBtuh: Split-10 SEER <65kBtuh: SP-9.7 SEER	<65kBtuh: Split-12 SEER <65kBtuh: SP-12 SEER	90.1-2004 provides both electric and non-electric heating efficiencies (03 IECC does not). It also provides a few other configurations.
Heating Efficiency	<65kBtuh: Split-6.8 HSPF <65kBtuh: SP-6.6 HSPF	<65kBtuh: Split-7.4 HSPF <65kBtuh: SP-7.4 HSPF	90.1-2004 provides ratings for 47/43F and 17/15F ambient (03 IECC only provides 47/43)

Nebraska Climate Zone Comparison Chart

Zone 15 (2003 IECC) .vs. Zone 5 (ASHRAE Std. 90.1-2004)

Component	2003 IECC	ASHRAE 90.1-2004 Baseline Building	Notes
Envelope			
Wall	Metal framing *0-10%*; R-13 + R-3 ci *10.1-25%*; R-13 + R-3 ci *25.1-40%*; R-13 + R-7 ci	R-13 + R-3.8 ci, steel framed U-Value = 0.084	ci = Continuous Insulation
Roof	*0-10%*; R-20 ci *10.1-25%*; R-20 ci *25.1-40%*; R-24 ci	R-15 Entirely above deck U-Value = 0.063	
Window; WWR% shown	Assuming PF < 0.25 *0-10%*; U=0.7, SHGC=Any *10.1-25%*; U=0.5, SHGC=0.5 *25.1-40%*; U=0.4, SHGC=0.5	*0-10%*; U=0.57, SHGC=0.49 *10.1-40%*; U=0.57, SHGC=0.39	SHGC = Solar Heat Gain Coefficient
Lighting	1.2 W/sf	1.2 W/sf	
HVAC System	Unitary A/Cs, cond. units, and Heat Pumps	Unitary A/Cs, cond. units, and Heat Pumps	
Cooling Efficiency	<65kBtuh: Split-10 SEER <65kBtuh: SP-9.7 SEER	<65kBtuh: Split-12 SEER <65kBtuh: SP-12 SEER	90.1-2004 provides both electric and non-electric heating efficiencies (03 IECC does not). It also provides a few other configurations.
Heating Efficiency	<65kBtuh: Split-6.8 HSPF <65kBtuh: SP-6.6 HSPF	<65kBtuh: Split-7.4 HSPF <65kBtuh: SP-7.4 HSPF	90.1-2004 provides ratings for 47/43F and 17/15F ambient (03 IECC only provides 47/43)

NEBRASKA PUBLIC POWER DISTRICT

Schedule: GS Issued: 11/25/08

Supersedes Schedule: GS Issued: 04/23/07

Sheet No: 1 of 3 Sheets

GENERAL SERVICE RATE SCHEDULE

(Name of Schedule)

AVAILABLE: In the retail distribution service territory of the District.

APPLICABLE: To commercial and nonresidential establishments for lighting, heating, and power purposes where all service is taken through a single meter at one location, and where the Customer's peak demand does not exceed 100 kW during any two summer months or 200 kW in any two months of a 12 consecutive month period. However, any commercial Customer with a load factor of at least 250 kWh/kW and either: (1) a demand greater than 50 kW, or (2) consumption greater than 15,000 kWh during any three months of a 12 consecutive month period shall have the option of being billed under the General Service Demand Rate Schedule.

CHARACTER OF SERVICE: AC, 60 hertz, single-phase or three-phase, at any of the District's standard primary and secondary distribution voltages.

BASE RATE:

Subject to application of Retail Production Cost Adjustment (PCA) Rate Schedule.

General Service (Rate Codes 27 & 52):

Customer Charge:	Single-phase	$15.50 per month
	Three-phase	$19.00 per month

Energy Charge:

Summer	Winter	
9.57¢	7.45¢	per kilowatt-hour for the first 1,000 kilowatt-hours used per month.
8.42¢	5.90¢	per kilowatt-hour for the next 2,000 kilowatt-hours used per month.
8.42¢	5.45¢	per kilowatt-hour for all additional use.

Summer:

The summer rate shall apply to the Customer's prorated use from June 1 through September 30.

Winter:

The winter rate shall apply to the Customer's prorated use from October 1 through May 31.

TAX CLAUSE: In the event of the imposition of any new or increased tax or any payment in lieu thereof, in excess of that provided for under Article VIII, Section 11 of the Nebraska Constitution, by any lawful authority on the production, transmission, or sale of electricity, the rate provided herein may be increased to reflect the amount of such tax or in lieu of tax increase.

Effective: January 1, 2009

Approved: 11/14/08 Resolution No: 08-145 Issued by: Todd L. Swartz

NEBRASKA PUBLIC POWER DISTRICT

Schedule: GS **Issued:** 11/25/08

Supersedes Schedule: GS **Issued:** 04/23/07

Sheet No: 2 **of** 3 **Sheets**

GENERAL SERVICE RATE SCHEDULE

(Name of Schedule)

BASE RATE ADJUSTMENT:

Customers who are served from distribution facilities for which the District has a Lease Payment (LP) or Debt Service (DS) obligation and/or a 5% Gross Revenue Tax (GRT) obligation will have the Base Rate (excluding PCA but including applicable primary service discount) adjusted to include such obligations as shown in the following table:

Applicable Adjustment	Rate Formula
None	Base Rates
Gross Revenue Tax (GRT) Only	Base Rates ÷ 0.95
Lease Payment (LP) or Debt Service (DS) Only	Base Rates ÷ 0.88
LP/DS and GRT	Base Rates ÷ 0.83

In addition, for Customers served from distribution facilities for which the District has a 5% GRT obligation, the PCA will be adjusted to include such obligation by the following formula: PCA ÷ 0.95.

MINIMUM BILL: Customer Charge, subject to applicable Base Rate Adjustment.

PRIMARY SERVICE DISCOUNT: A discount of two percent (2%) of the total bill (excluding applicable PCA and Base Rate Adjustment) is applicable where:

1. The Customer takes service from the District's standard primary distribution voltage,

2. The Customer owns and maintains, or pays for all capital costs and all costs for repairs, renewals, improvements and additions, for all transformation from primary distribution voltage to Customer secondary utilization voltage and other distribution facilities beyond the primary voltage delivery point, and

3. Both the point of measurement and the point of delivery are located at the same point on the District's primary voltage distribution line.

TAX CLAUSE: In the event of the imposition of any new or increased tax or any payment in lieu thereof, in excess of that provided for under Article VIII, Section 11 of the Nebraska Constitution, by any lawful authority on the production, transmission, or sale of electricity, the rate provided herein may be increased to reflect the amount of such tax or in lieu of tax increase.

Effective: January 1, 2009

Approved: 11/14/08 **Resolution No:** 08-145 **Issued by:** Todd A. Swarts

NEBRASKA PUBLIC POWER DISTRICT

Schedule: GS **Issued:** 11/25/08

Supersedes Schedule: GS **Issued:** 04/23/07

Sheet No: 3 **of** 3 **Sheets**

GENERAL SERVICE RATE SCHEDULE

(Name of Schedule)

TERMS AND CONDITIONS:

1. Service will be furnished under the District's Retail Service Rules and Regulations.
2. Extensions made for service under this rate schedule are subject to the provisions of the District's "General Extension Policy for Retail Electric Services and Facilities".
3. The District's General Customer Service Charges Rate Schedule shall apply.
4. Usage shall be fractionalized on the actual days of service for application of a change in rate or changing from summer to winter or from winter to summer rates.
5. The Customer shall provide, if requested, suitable space on the Customer's premises for location of the District's transformation and any switching or capacitor equipment that may be required
6. For billing purposes, energy usage shall be normalized to 30 days when actual days of service is less than 27 days or exceeds 35 days in any given billing period.
7. The District retains and reserves the right, power and authority to modify, revise, amend, replace, repeal or cancel this rate schedule, at any time and in whole or in part, by resolution adopted by the District's Board of Directors.

TAX CLAUSE: In the event of the imposition of any new or increased tax or any payment in lieu thereof, in excess of that provided for under Article VIII, Section 11 of the Nebraska Constitution, by any lawful authority on the production, transmission, or sale of electricity, the rate provided herein may be increased to reflect the amount of such tax or in lieu of tax increase.

Effective: January 1, 2009

Approved: 11/14/08 **Resolution No:** 08-145 **Issued by:** Todd L. Swartz

SCHEDULE NO. 231

GENERAL SERVICE – SMALL DEMAND

Availability:

To all Consumers throughout the District's Service Area.

The single phase, or three phase if available, alternating current, electric service will be supplied at the District's standard voltages, for all uses, when all the Consumer's service at one location is measured by one kilowatthour meter with a demand register, unless a Consumer takes emergency or special service as required by the District's Service Regulations. Not applicable to shared or resale service.

This rate is not available to those Consumers taking Irrigation Service as identified in Rate Schedule No. 226.

Net Monthly Rate:

A Basic Service Charge of: $ 16.75 plus

A Demand Charge of:
$ 81.00 for the first 18 kilowatts of demand, and
$ 4.50 per kilowatt for all additional kilowatts of demand; plus

An Energy Charge of:
Summer 5.44 cents per kilowatthour for the first 300 kilowatthours per kilowatt of demand, and
3.34 cents per kilowatthour for all additional kilowatthours.

The summer rate will be applicable June 1 through September 30.

Winter 4.35 cents per kilowatthour for the first 300 kilowatthours per kilowatt of demand, and
2.28 cents per kilowatthour for all additional kilowatthours.

The winter rate will be applicable October 1 through May 31.

The provisions of Rate Schedule No. 461A – Fuel and Transportation Cost Adjustment apply to this rate schedule.

Minimum Monthly Bill:

$ 97.75

Gross Monthly Bill:

The net monthly bill, computed in accordance with the Net Monthly Rate; plus an amount of 4%, which amount will be deducted if the bill is paid on or before the gross date thereon.

Determination of Demand:

Demand, for any billing period, shall be the kilowatts as shown by or

SCHEDULE NO. 231

GENERAL SERVICE – SMALL DEMAND

computed from the readings of the District's kilowatthour meter with a demand register, for the 15-minute period of Consumer's greatest use during such billing period.

If the demand, so determined, however, is less than 85% of the Consumer's highest 15-minute kilovoltampere demand, the kilowatt demand will be increased for the purposes of this schedule by 50% of the difference between 85% of the kilovoltampere demand and the demand as determined above.

Such demand must be equal to or greater than the larger of the following:

85% of the highest 15-minute power factor adjusted demand during the summer billing months of the preceding 11 months, or

60% of the highest 15-minute power factor adjusted demand during the winter billing months of the preceding 11 months, or

18 kilowatts.

Schedule Duration:

A minimum of one year.

Reconnection Charge:

If a Consumer whose service has been terminated has such service reconnected within 12 months of such termination, a reconnection charge equal to the minimum monthly charge for the preceding 12 months, or any part thereof, shall be collected by the District.

Service Regulations:

The District's Service Regulations form a part of this schedule.

District Level Payment Plan:

For Consumers meeting the eligibility requirements specified in the District's Service Regulations, the Consumer may elect to be billed on the District's Level Payment Plan.

Special Conditions:

Consumer shall furnish, if requested, suitable space on the Consumer's premises for the District's transforming equipment, and if required, suitable space for switching and/or capacitor equipment.

District shall not be required to furnish duplicate service hereunder.

SCHEDULE F

FIXED RATE GAS SERVICE

EFFECTIVE JANUARY 2, 2007

(Supersedes Schedule F, effective January 2, 2005)

AVAILABILITY

This rate schedule is available to customers contracting for the purchase of fixed quantities of natural gas at a fixed price for up to a 36-month period.

1. Customer must be purchasing gas under one of the following commercial or industrial gas rate schedules.

   - Schedule B, Commercial or Industrial Firm Gas Service
   - Schedule C, Large Volume Firm Gas Service
   - Schedule No. 3, Interruptible Gas Service
   - Schedule CS – 1, Contract Gas Service

2. Customer must have total gas requirements of not less than 200 decatherms per day. (Multiple meters/sites may be combined to meet this requirement.)

3. Remote automatic meter reading facilities must be installed to District specifications for each meter combined under the contract. Installation will be at customer expense.

4. Customer must have authorized personnel available during normal working hours who can accept or reject the fixed price offered upon notice from the District. (The Energy Acquisitions Department will solicit offers from gas marketers and other suppliers for packages of gas to meet the customers' requests. Energy Acquisitions will advise customers of the best offer available and of the window available for acceptance.)

RATE – MONTHLY BILLING

The contract "unit cost of gas" (UCOG) purchased by the District for this service will displace the variable "weighted-average cost of gas" (WACOG) included in the commodity charge of District rate schedules as adjusted by the monthly GCA (gas cost adjustment). All other charges in the applicable rate schedules will apply to this service. A monthly administrative charge will also apply.

The District reserves the right to pass on any additional tax or surcharge that may be imposed on the sale or transportation of gas under this rate schedule by any governmental or regulatory body during the course of the contract year.

Administrative charges will be applied per month per contract. Monthly charges for billing purposes by rate schedule:

Schedule B:

- Basic administrative charge (one delivery point) $ 98.00
- Additional administrative charge per each additional delivery point 49.00
- Schedule B service charge – per meter 16.66
- Schedule B commodity charges (excluding commodity WACOG) to be added to the contract UCOG:

	Nov. - Mar.	Apr. - Oct.
First 250 Dth/month	$ 1.316/Dth	$ 0.806/Dth
Over 250Dth	1.218	0.708

Schedule C:

- Basic administrative charge (one delivery point) $ 98.00
- Additional administrative charge per each additional delivery point 49.00
- Schedule C demand charge $ 6.8132/Dth/max day
- Schedule C commodity charge to be added to the contract UCOG $ 0.3506/Dth

(Note: Firm rates are subject to adjustment for changes in pipeline/marketer reservation/surcharges.)

Schedule No. 3:

- Basic administrative charge (one delivery point) $ 98.00
- Additional administrative charge per each additional delivery point 49.00
- Schedule No. 3 service charge – per meter $1,078.00
- Non gas component of Schedule 3 commodity charge to be added to the contract UCOG:

First 5,000 Dth per month	$ 0.4271/Dth
Over 5000 Dth per month	0.3506

Schedule CS – 1:

- Basic administrative charge (one delivery point) $ 98.00
- Additional administrative charge per each additional delivery point 49.00
- Other charges as contracted plus UCOG contract price.

ADDITIONAL CHARGES

Actual volumes purchased will be balanced to contract quantities. Additional charges may apply:

- If actual volumes used are less than contract volumes for the billing month and the contract UCOG is greater than the system WACOG for the month, an additional charge equal to the contract UCOG minus the system WACOG per decatherm will apply to the variance of actual volumes from contract volumes. If a variance is caused by District curtailment, no additional charges will apply.

- If actual volumes used are greater than contract volumes for the billing month, actual volumes in excess of contract volumes will be billed at the customer's applicable underlying rate schedule, i.e., rate schedule B, C, No. 3, or CS-1.

STATUTORY PAYMENT TO CITIES

Under Sections 14-2138 and 2139, R.R.S.1997, the District is required to pay to each city or village two (2) percent of retail sales of gas. Two (2) percent has not been included in the above rate. Therefore, the rate for all customers residing inside corporate limits is 2 percent greater than the rate indicated above. The UCOG contract price will also be adjusted to include two (2) percent for city or village when applicable.

OTHER TERMS AND CONDITIONS

All terms and conditions of the customers' applicable underlying rate schedules that are not modified by the above shall apply to gas service rendered under this rate schedule.

MUD - Commodity Charge

Date	Commodity Charge *(0-2500 Th)* $/Th	Commodity Charge *(2500+ Th)* $/Th)
4/2/2009	0.4393	0.4295
3/2/2009	0.6313	0.6215
2/2/2009	0.6894	0.6796
1/2/2009	0.7822	0.7724
12/2/2008	0.7632	0.7534
11/2/2008	0.6054	0.5966
10/2/2008	0.5795	0.5697
9/2/2008	0.7971	0.7873
8/2/2008	0.921	0.9112
7/2/2008	1.282	1.2722
6/2/2008	1.1423	1.1325
5/2/2008	1.1076	1.0987
Average	**0.811691667**	**0.80205**

RATE SCHEDULE - TSS
TRADITIONAL SALES SERVICE

1. AVAILABILITY: Service under this rate schedule is available only to residential and commercial customers located within the municipal boundaries and surrounding rural areas of Rate Areas I, II, and III.

2. APPLICABILITY AND CHARACTER OF SERVICE: This rate schedule shall apply to firm gas service for customers whose normal requirements do not exceed 500 Therms on a peak day and such service shall not be subject to interruption.

3. RATE INFORMATION: RATE AREA I, RATE AREA II, & RATE AREA III

   Pipelines: Northern Natural Gas Company
   Natural Gas Pipeline Company of America (NGPL)
   Kinder Morgan, Inc (Rate Area III only)

	Residential	Commercial
Customer Charge:	$12.00 per month	$17.00 per month
Delivery Charge (Base Rate)		
Base Rate:	$.15406 per Therm	$.17561 per Therm

Minimum monthly bill shall be the Customer Charge.

4. ADJUSTMENT FOR PURCHASE OF GAS: The Commodity Charge (Cost of Gas Supply) is in addition to the Delivery Charge shown above. The Commodity Charge will be adjusted monthly for changes in the cost of gas, in accordance with Original Index No. 8.

5. DUE DATE: Bills will be due 20 days after Black Hills Energy's Mailing Date. Late payment Penalty: One percent (1%) of balance not paid on or before due date.

6. FRANCHISE FEE: A franchise fee will be added to the monthly bill computed on this rate schedules when appropriate.

7. REGULATORY ASSESSMENT AND TAXES: Regulatory Assessment or other taxes, fees, or charges required by a governmental authority will be added to the monthly bill.

BLACK HILLS ENERGY

NEBRASKA FIRM COMMERCIAL/INDUSTRIAL RATES
12-MONTH HISTORY

	Volumetric Billing Rates ($/Therm)			Monthly Charges ($/Customer)	
	Metro	Lincoln	Outstate	Customer Charge	NPSC Surcharge
				All Areas	
Apr-09	0.70796	0.65931	0.82569	17.00	0.13
Mar-09	0.86706	0.89738	0.95044	17.00	0.13
Feb-09	0.86122	0.91425	0.96654	17.00	0.13
Jan-09	0.87283	0.92513	0.97230	17.00	0.09
Dec-08	0.93020	0.90780	0.99679	17.00	0.09
Nov-08	0.71333	0.73657	0.80073	17.00	0.09
Oct-08	0.80283	0.79747	0.81699	17.00	0.10
Sep-08	0.98511	1.00106	0.88362	17.00	0.10
Aug-08	1.11103	1.13449	1.14565	17.00	0.10
Jul-08	1.50296	1.53329	1.48179	17.00	0.07
Jun-08	1.32756	1.35705	1.35947	17.00	0.07
May-08	1.25227	1.29042	1.31182	17.00	0.07

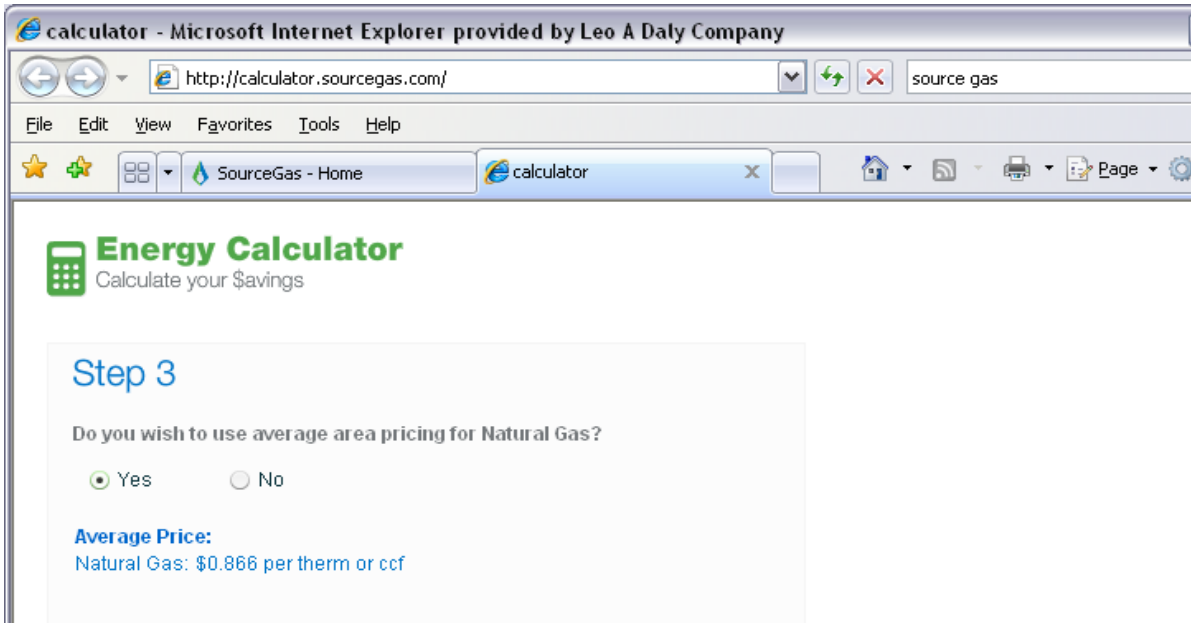
Copies of the official tariff sheets are available at offices providing service under the tariffs, and at the governing local or national commission offices. The information available here attempts to be materially the same, but should there be any discrepancies, in all cases the official tariffs on file with the governing commission will hold over these documents.

SOURCE GAS

*Future Per MMBtu**	
Month	**NYMEX**
Jun-09	$4.31
Jul-09	$4.42
Aug-09	$4.52
Sep-09	$4.59
Oct-09	$4.72
Nov-09	$5.38
Dec-09	$6.07
Jan-10	$6.37
Feb-10	$6.39
Mar-10	$6.34
Apr-10	$6.13
May-10	$6.18
	$0.55

*Historical Per MMBtu**	
Month	**NYMEX**
Jun-08	$11.93
Jul-08	$13.11
Aug-08	$9.23
Sep-08	$8.40
Oct-08	$7.48
Nov-08	$6.47
Dec-08	$6.90
Jan-09	$6.16
Feb-09	$4.47
Mar-09	$4.07
Apr-09	$3.65
May-09	$3.33
	$0.71

*1MMBtu = 10 Therms



IV. PROJECT DESCRIPTION AND SCOPE OF WORK

The bidder must provide the following information in response to this Request for Proposal.

A. PROJECT OVERVIEW

This project will consist of the development, analysis and publication of an energy study that quantifies the economic, energy and environmental benefits to the State of Nebraska of the adoption of an Advanced Commercial Building Energy Code that exceeds by 30% the building and lighting requirements of the 2006 International Energy Conservation Code (IECC) and the American Society of Heating Refrigeration and Air-Conditioning Engineers (ASHRAE) 90.1-2004 Standard.

B. SCOPE OF WORK

The successful bidder will complete and provide to the Nebraska Energy Office a Nebraska-Specific Advanced Commercial Building Energy Code (NABEC) Energy Study that includes each of the following:

1. Energy modeling of ten (10) typical Nebraska commercial building types.

- **a.** A Small Office Building with an 18% window-to-wall ratio
- **b.** A Small Office Building with a 38% window-to-wall ratio
- **c.** A Large Office Building with an 18% window-to-wall ratio
- **d.** A Large Office Building with a 38% window-to-wall ratio
- **e.** A Small Retail Building
- **f.** A Retail Strip Mall
- **g.** A Large Big Box Retail Building
- **h.** An Elementary Education Building
- **i.** A Secondary Education Building
- **j.** A Warehouse

Each building will be energy modeled as per the following building energy codes or advanced building energy standards:

- **a.** The Small Office Buildings with an 18% window-to-wall ratio
  - **i.** 2003 IECC – Zone 13 (Omaha)
  - **ii.** 2003 IECC – Zone 14 (Norfolk)
  - **iii.** 2003 IECC – Zone 15 (Chadron)
  - **iv.** 2006 IECC – Zone 5 (Nebraska)
  - **v.** ASHRAE Advanced Energy Guideline for Small Office Buildings plus ASHRAE 90.1-2004

- **b.** The Small Office Buildings with a 38% window-to-wall ratio
  - **i.** 2003 IECC – Zone 13 (Omaha)
  - **ii.** 2003 IECC – Zone 14 (Norfolk)
  - **iii.** 2003 IECC – Zone 15 (Chadron)
  - **iv.** 2006 IECC – Zone 5 (Nebraska)
  - **v.** ASHRAE Advanced Energy Guideline for Small Office Buildings plus ASHRAE 90.1-2004

c. The Large Office Building with an 18% window-to-wall ratio
- **i.** 2003 IECC – Zone 13 (Omaha)
- **ii.** 2003 IECC – Zone 14 (Norfolk)
- **iii.** 2003 IECC – Zone 15 (Chadron)
- **iv.** 2006 IECC – Zone 5 (Nebraska)
- **v.** 30% Better than 2006 IECC building and lighting requirements (based on a COMcheck analysis) and mechanical system requirements of the Energy Star® program or the Consortium for Energy Efficiency's High Efficiency Commercial Air Conditioning and Heat Pump Initiatives.

d. The Large Office Building with a 38% window-to-wall ratio
- **i.** 2003 IECC – Zone 13 (Omaha)
- **ii.** 2003 IECC – Zone 14 (Norfolk)
- **iii.** 2003 IECC – Zone 15 (Chadron)
- **iv.** 2006 IECC – Zone 5 (Nebraska)
- **v.** 30% Better than 2006 IECC building and lighting requirements (based on a COMcheck analysis) and mechanical system requirements of the Energy Star® program or the Consortium for Energy Efficiency's High Efficiency Commercial Air Conditioning and Heat Pump Initiatives.

e. The Small Retail Building
- **i.** 2003 IECC – Zone 13 (Omaha)
- **ii.** 2003 IECC – Zone 14 (Norfolk)
- **iii.** 2003 IECC – Zone 15 (Chadron)
- **iv.** 2006 IECC – Zone 5 (Nebraska)
- **v.** ASHRAE Advanced Energy Guideline for Small Retail Buildings plus ASHRAE 90.1-2004

f. The Retail Strip Mall
- **i.** 2003 IECC – Zone 13 (Omaha)
- **ii.** 2003 IECC – Zone 14 (Norfolk)
- **iii.** 2003 IECC – Zone 15 (Chadron)
- **iv.** 2006 IECC – Zone 5 (Nebraska)
- **v.** 30% Better than 2006 IECC building and lighting requirements (based on a COMcheck analysis) and mechanical system requirements of the Energy Star® program or the Consortium for Energy Efficiency's High Efficiency Commercial Air Conditioning and Heat Pump Initiatives.

g. The Large Big Box Retail Building
- **i.** 2003 IECC – Zone 13 (Omaha)
- **ii.** 2003 IECC – Zone 14 (Norfolk)
- **iii.** 2003 IECC – Zone 15 (Chadron)
- **iv.** 2006 IECC – Zone 5 (Nebraska)
- **v.** 30% Better than 2006 IECC building and lighting requirements (based on a COMcheck analysis) and mechanical system requirements of the Energy Star® program or the Consortium for Energy Efficiency's High Efficiency Commercial Air Conditioning and Heat Pump Initiatives.

h. The Elementary Education Building
- **i.** 2003 IECC – Zone 13 (Omaha)
- **ii.** 2003 IECC – Zone 14 (Norfolk)
- **iii.** 2003 IECC – Zone 15 (Chadron)
- **iv.** 2006 IECC – Zone 5 (Nebraska)
- **v.** ASHRAE Advanced Energy Guideline for K-12 Schools plus ASHRAE 90.1-2004

i. The Secondary Education Building
- **i.** 2003 IECC – Zone 13 (Omaha)
- **ii.** 2003 IECC – Zone 14 (Norfolk)
- **iii.** 2003 IECC – Zone 15 (Chadron)
- **iv.** 2006 IECC – Zone 5 (Nebraska)
- **v.** ASHRAE Advanced Energy Guideline for K-12 Schools plus ASHRAE 90.1-2004

j. The Warehouse
- **i.** 2003 IECC – Zone 13 (Omaha)
- **ii.** 2003 IECC – Zone 14 (Norfolk)
- **iii.** 2003 IECC – Zone 15 (Chadron)
- **iv.** 2006 IECC – Zone 5 (Nebraska)
- **v.** ASHRAE Advanced Energy Guideline for Warehouses and Self Storage Buildings plus ASHRAE 90.1-2004

2. An analysis of the construction costs impact of the improved building energy components based on the latest RS Means Construction Costs data available and quotes from local vendors and suppliers, or their wholesalers. Only the costs for building components that differ between the specified energy codes or standards shall be included in the construction costs analysis. The total price for each component shall include the purchase price, installation, overhead and profit. This total price may then be adjusted based on the RS Means Adjustment factors to determine the local cost for Omaha, Norfolk and Chadron. In the case of the 2006 IECC and the advanced standards the local costs for Omaha shall be used.

3. Incorporate into each building energy model the current utility rates charged by Nebraska's utilities for each of the specified locations. In the case of the 2006 IECC and the advanced standards the utility costs for Omaha shall be used. The following utilities serve the specified communities:

City	Gas Supplier	Electric Supplier
Omaha	Metropolitan Utilities District	Omaha Public Power District
Norfolk	Black Hills Energy	Nebraska Public Power District
Chadron	Source Gas	Nebraska Public Power District

4. A Life Cycle Cost (LCC) analysis per building type that utilizes the methodology published by the U.S. Department of Energy for the Life Cycle Cost analysis of energy conservation projects. This methodology forms the basis for the National Institute of Standards and Technology (NIST) Building Life Cycle Cost (BLCC) program, which is used to calculate life cycle costs for government projects. The LCC analyses for each of the buildings in the analysis will be performed over a 20 year period.

5. The completed study will include a section that generalizes the economic impact on the state of updating the state-wide energy code from the 2003 IECC to either the 2006 IECC or a Standard that is 30% Better than the 2006 IECC or ASHRAE 90.1-2004 or the Advanced Energy Guidelines. The impact will be evaluated based on commercial building construction start data from each of the three communities and their associated 2003 IECC weather zones.

6. An Analysis Summary Section that quantifies for building in each community constructed under each code/standard the:

- **a.** Incremental construction cost in 2008 dollars (2006 IECC and 30% Better Standards Only)
- **b.** Electrical and natural gas loads for heating, cooling, water heating and lighting
- **c.** Additional mortgage payment costs (2006 IECC and 30% Better Standard Only)
- **d.** Annual energy costs in 2009 dollars
- **e.** First year mortgage cost – energy costs savings for upgrade to the 2006 IECC
- **f.** First year mortgage cost – energy cost savings for upgrade to the 30% Better Standard
- **g.** Life cycle cost in 2009 dollars

7. A Project Summary Section that quantifies for the entire state the impact of building upgrading the state wide code to meet the minimum code/standard. This section shall include:

- **a.** The Incremental construction cost in 2008 dollars (2006 IECC and 30% Better Standards Only)
- **b.** Electrical and natural gas loads for heating, cooling, water heating and lighting
- **c.** Additional mortgage payment costs (2006 IECC and 30% Better Standard Only)
- **d.** Annual energy costs in 2009 dollars
- **e.** First year mortgage cost – energy costs savings for upgrade to the 2006 IECC
- **f.** First year mortgage cost – energy cost savings for upgrade to the 30% Better Standard
- **g.** Life cycle cost in 2009 dollars

The Energy modeling of ten (10) typical Nebraska commercial building types shall be based on the following building descriptions.

8. a & b) Small Office Buildings – a (18% window-to-wall ratio) & b (38% window-to-wall ratio)

- **a.** Building Envelope: 10,000 square foot ,1 floor, rectangular footprint, 75’ x 133’-4”, 14 ft exterior wall height, metal roof joists with above deck continuous insulation, CMU block exterior walls with metal interior framing and batt insulation, slab-on-grade construction
- **b.** HVAC: Forced air gas furnaces, split system air conditioning units, ducts within the conditioned space, outdoor air economizer
- **c.** Water Heating: Natural gas storage type system
- **d.** Lighting: Fluorescent fixtures used for general lighting throughout the building with minimal task lighting in the enclosed offices and for open office area work stations. Utilize Entire/Whole Building Lighting Power Densities. Assume lighting levels from exterior lighting requirements for building facade, entrance and exiting doors lighting.

9. c & d) Large Office Buildings – c (18% window-to-wall ratio) & d (38% window-to-wall ratio)

- **a.** Building Envelope: 60,000 square foot, 3 floors, rectangular footprint, 100' x 200', 12 ft floor-to-floor height, 38 ft totals exterior wall height, metal roof joists with above deck continuous insulation, metal framed exterior walls with cavity batt insulation, slab-on-grade construction
- **b.** HVAC: Gas-fired rooftop units, roof-top air conditioning units, outdoor air economizer
- **c.** Water Heating: Electric storage type system (1 unit per floor)
- **d.** Lighting: Fluorescent fixtures used for general lighting throughout the building with minimal task lighting in the enclosed offices and for open office area work stations. Utilize Entire/Whole Building Lighting Power Densities. Assume lighting levels from exterior lighting requirements for building facade, entrance and exiting doors lighting.

10. e) Small Retail Building

- **a.** Building Envelope: 5,000 square foot, 8% window-to-wall ratio, 1 floor, rectangular footprint, 40' x 125', 14 ft exterior wall height, wood roof joists with 2" insulation on the roof and additional cavity batt insulation, metal framed exterior walls with exterior rigid insulation and additional fiberglass batt cavity insulation, slab-on-grade construction, 1/3 of the square footage used for product storage area including a 120 sq. ft. office and support area,
- **b.** HVAC: Forced air gas furnaces, split system air conditioning units, ducts within the conditioned space, outdoor air economizer.
- **c.** Water Heating: Natural gas storage type system.
- **d.** Lighting: Fluorescent fixtures used for general lighting throughout the building. Utilize Entire/Whole Building Lighting Power Densities including display area lighting. Exterior security lighting at both entries and to light signage at the store front.

11. f) Retail Strip Mall

- **a.** Building Envelope: 13,500 total square feet in six bays of 2,183 square foot each,1 floor, rectangular footprint, 75' x 180', 14 ft exterior wall height, metal roof joists with batt insulation installed between joists, CMU block exterior walls with metal interior framing and batt insulation on three walls and one 180' face with store front glazing, slab-on-grade construction. One bay houses a restaurant, one bay houses an auto supply store, one bay houses a medical supply store and the remaining three bays house retail space. 30% of the floor area in each bay is utilized for office and storage or kitchen area.
- **b.** HVAC: Gas-fired rooftop units, roof-top air conditioning units, outdoor air economizer.
- **c.** Water Heating: Electric storage type system (1 unit per bay).
- **d.** Lighting: Fluorescent fixtures used for general lighting throughout the entire building. Utilize Entire/Whole Building Lighting Power Densities with display lighting included for product merchandizing in 20% of the floor area in the three (3) retail spaces. Assume lighting levels from exterior lighting requirements for building facade, entrance and exiting doors lighting.

12. g) Large Big Box Retail Building

a. Building Envelope: 100,000 square foot, 2% window-to-wall ratio, 1 floor, rectangular footprint, 250' x 400', 20 ft exterior wall height, metal roof joists with continuous insulation, CMU block exterior walls with metal interior framing and batt insulation, slab-on-grade construction, 10% of the building floor area houses offices, support areas and storage areas, 2 dock doors to the storage area, two walk doors for exiting and main storefront door. 6,000 square foot of the floor area houses office, support and restroom areas and 14,000 square foot houses product storage. Two dock doors enter into the storage area with four additional walk doors (excluding the main entry) included in the plan.

b. HVAC: Gas-fired rooftop units, roof-top air conditioning units, outdoor air economizer.

c. Water Heating: Natural gas storage type system.

d. Lighting: High bay fluorescent fixtures used for general lighting throughout the retail and storage areas. Utilize Tenant Area or Portion of Building Lighting Power Densities with display lighting included for product merchandizing in 4,000 square foot of the floor area. Standard fluorescent fixtures to be used in the office and support areas located in a dropped ceiling. Assume lighting levels from exterior lighting requirements for building façade, entrance and exiting doors lighting.

13. h) Education – Elementary

a. Building Envelope: 50,000 square foot, 18% window-to-wall ratio, number of floors 1, rectangular footprint, 150' x 333'-4", 14 ft exterior wall height, metal roof joists with continuous insulation, CMU block exterior walls with metal interior framing and batt insulation, slab-on-grade construction. 20% of the square footage houses the facility's gymnasium/multi-purpose room and cafeteria. An additional 10% of the facility square footage houses the media center and office/support areas. The remaining 70% is utilized for classrooms.

b. HVAC: Packaged air-to-air heat pumps, ducts within the conditioned space, outdoor air economizer.

c. Water Heating: Electric storage type units with individual units located throughout the facility.

d. Lighting: Fluorescent fixtures used for general lighting throughout the facility excluding high bay high pressure sodium fixtures in the gymnasium. Assume lighting levels from exterior lighting requirements for building facade, entrance and exiting doors lighting.

14. i) Education – Secondary School

a. Building Envelope: 80,000 square foot, 18% window-to-wall ratio, number of floors 1, U-shaped footprint with bottom of U 166'-8" x 300' and two sides 100' x 150', 14 ft exterior wall height, metal roof joists with continuous insulation, CMU block exterior walls with metal interior framing and batt insulation, slab-on-grade construction. 20% of the square footage houses gymnasiums, locker areas and a cafeteria. An additional 10% of the facility square footage houses the library, media center and office/support areas. The remaining 70% is utilized for classrooms.

b. HVAC: Packaged air-to-air heat pumps, ducts within the conditioned space, outdoor air economizer.

c. Water Heating: Electric storage type units with individual units located throughout the facility.

d. Lighting: Fluorescent fixtures used for general lighting throughout the facility excluding high bay high pressure sodium fixtures in the gymnasiums and cafeteria. Assume lighting levels from exterior lighting requirements for building facade, entrance and exiting doors lighting.

15. j) Warehouse

a. Building Envelope: 48,000 square foot, 0% window-to-wall ratio, number of floors 1, rectangular footprint, 200' x 240' (40' bays), 18 ft exterior wall height, metal roof joists with continuous insulation, CMU block exterior walls with metal interior framing and batt insulation, slab-on-grade construction, 20'x20' office/support area, three dock doors and three additional walk doors,

b. HVAC: Natural gas fired, tube type infrared heaters in warehouse area, natural gas fired furnace in office/support area, split system air conditioning unit in office/support area, ducts within the conditioned space, outdoor air economizer.

c. Water Heating: Natural gas storage type system

d. Lighting: High Pressure Sodium standard bay fixtures in the warehouse area, fluorescent lighting in the office/support area. Minimal exterior security lighting around the building, including at all walk and dock doors.

C. PROVIDE POST IMPLEMENTATION SUPPORT

Appropriate staff members of the successful bidding company/association will provide post analysis support to the Nebraska Energy Office and members of the Nebraska Legislature:

1. at a legislative interim study hearing to introduce the Nebraska-Specific Advanced Commercial Building Energy Code (NABEC) Energy Study and provide information regarding the study process and the energy use impact on the state of updating its commercial building energy code.

2. as needed, electronically or via telephone, to the Nebraska Energy Office during the study review process and following the dissemination of the report to the public, the states utility industry, project stakeholders and other members of Nebraska's construction industry.

D. DELIVERABLES

The completed Nebraska specific Advanced Commercial Building Energy Code (NABEC) Energy Study including the requirements/specifications herein described must be submitted to the Nebraska Energy Office in the following formats on or before October 1, 2009:

1. Hard Copy Form – suitable for copying and distribution to members and staff of the Nebraska Legislature and other interested members of Nebraska's construction industry.

2. Electronic Form – suitable for inclusion on the Nebraska Energy Office website, distribution as requested to interested members of Nebraska's construction industry and distribution to the U.S. Department of Energy and other State and Territory Energy Offices.

3. Payment Schedule:

Deliverables Submittal and Payment Distribution Schedule		
Deliverable to be submitted	**Submittal Date**	**Maximum Payment Distribution %**
Energy modeling design parameters and results for all specified building energy codes or advanced building energy standards on: **1.** Small Office Building – 18% Window-to-Wall Ratio **2.** Small Office Building – 38% Window-to-Wall Ratio **3.** Large Office Building – 18% Window-to-Wall Ratio **4.** Large Office Building – 38% Window-to-Wall Ratio **5.** Small Retail Building for review and approval by the Nebraska Energy Office	06/22/2009	35%
Energy modeling design parameters and results for all specified building energy codes or advanced building energy standards on: **6.** Retail Strip Mall **7.** Large Big Box Retail Building **8.** Elementary Education Building **9.** Secondary Education Building **10.** Warehouse for review and approval by the Nebraska Energy Office	08/18/2009	30%
Preliminary study including the required Analysis Summary Section for review and approval by the Nebraska Energy Office	09/01/2009	20%
The final Nebraska specific Advanced Commercial Building Energy Code Energy Study in hard copy and electronic form.	10/01/2009	10%
Provide post analysis support.	11/20/2009	5%

CEE UNITARY AIR-CONDITIONING SPECIFICATION

CEE periodically revises its specifications. See www.cee1.org for the most recent version.
For Terms and Conditions of these specifications, see www.cee1.org/terms.php3

Equipment Type	Size Category	Sub-Category	CEE Tier 1	CEE Tier 2
Air Conditioners, Air Cooled (Cooling Mode)	<65,000 Btu/h	Split System	14.0 SEER 12.0 EER	15.0 SEER 12.5 EER
		Single Package	14.0 SEER 11.6 EER	15.0 SEER 12.0 EER
	≥65,000 Btu/h and <135,000 Btu/h	Split System and Single Package	11.5 EER 11.9 IPLV	12.0 EER 12.4 IPLV
	≥135,000 Btu/h and <240,000 Btu/h	Split System and Single Package	11.5 EER 11.9 IPLV	12.0 EER 12.4 IPLV
	≥240,000 Btu/h and <760,000 Btu/h	Split System and Single Package	10.5 EER 10.9 IPLV	10.8 EER 12.0 IPLV
	≥760,000 Btu/h	Split System and Single Package	9.7 EER 11.0 IPLV	10.2 EER 11.0 IPLV
Air Conditioners, Water and Evaporatively Cooled	<65,000 Btu/h	Split System and Single Package	14.0 EER	No specification*
	≥65,000 Btu/h and <135,000 Btu/h	Split System and Single Package	14.0 EER	No specification*
	≥135,000 Btu/h	Split System and Single Package	14.0 EER	No specification*

SEER – Seasonal Energy Efficiency Ratio EER – Energy Efficiency Ratio IPLV – Integrated Part Load Value

*At this time, CEE is not establishing higher tier levels for this equipment size due to limited availability.

NOTES:
1. For electrical resistance heating section types, increase required minimum EER by 0.2.
2. Integrated Partial Load Values will be revised at a future date as new test procedures come into effect on January 1, 2010.

CEE UNITARY HEAT PUMP SPECIFICATION

CEE periodically revises its specifications. See www.cee1.org for the most recent version.
For Terms and Conditions of these specifications, see www.cee1.org/terms.php3

Equipment Type	Size Category	Sub-Category	CEE Tier 1	CEE Tier 2
Air Cooled (Cooling Mode)	<65,000 Btu/h	Split System	14.0 SEER 12.0 EER	15.0 SEER 12.5 EER
		Single Package	14.0 SEER 11.6 EER	15.0 SEER 12.0 EER
	≥65,000 and <135,000 Btu/h	Split System and Single Package	11.5 EER 11.9 IPLV	12.0 EER 12.4 IPLV
	≥135,000 and <240,000 Btu/h	Split System and Single Package	11.5 EER 11.9 IPLV	12.0 EER 12.4 IPLV
	≥240,000 and <760,000 Btu/h	Split System and Single Package	10.5 EER 10.9 IPLV	10.8 EER 12.0 IPLV
Air Cooled, (Heating Mode)	<65,000 Btu/h	Split System	8.5 HSPF	9.0 HSPF
		Single Package	8.0 HSPF	8.5 HSPF
	≥65,000 and <135,000 Btu/h	47°F db/43°Fwb Outdoor Air	3.4 COP	No specification*
		17°F db/15°Fwb Outdoor Air	2.4 COP	No specification*
	≥135,000 Btu/h	47°F db/43°Fwb Outdoor Air	3.2 COP	No specification*
		17°F db/15°Fwb Outdoor Air	2.1 COP	No specification*
Water Source (Cooling Mode)	<135,000 Btu/h	85° Entering Water	14.0 EER	No specification*
Water Source (Heating Mode)	<135,000 Btu/h	70° Entering Water	4.6 COP	No specification*

SEER – Seasonal Energy Efficiency Ratio
HSPF – Heating Seasonal Performance Factor
COP – Coefficient of Performance
EER – Energy Efficiency Ratio
IPLV – Integrated Part Load Value

*At this time, CEE is not establishing higher tier levels for this equipment size due to limited availability.

NOTES:
1. For electrical resistance heating section types, increase required minimum EER by 0.2.
2. Integrated Partial Load Values will be revised at a future date as new test procedures come into effect on January 1, 2010.

NISTIR 85-3273-24
(Rev. 5/09)

Energy Price Indices and Discount Factors for Life-Cycle Cost Analysis – 2009

Annual Supplement to
NIST Handbook 135 and
NBS Special Publication 709

Amy S. Rushing
Barbara C. Lippiatt

U.S. DEPARTMENT OF COMMERCE
Technology Administration
National Institute of Standards
and Technology

Prepared for
United States Department of Energy
Federal Energy Management Program

May 2009

(2) *Energy Price Indices and Discount Factors for Life-Cycle Cost Analysis, Annual Supplement to NIST Handbook 135 and NBS Special Publication 709*, National Institute of Standards and Technology, NISTIR 85-3273.

This report, which is updated annually, provides the current DOE and OMB discount rates, projected energy price indices, and corresponding discount factors needed to estimate the present values of future energy and non-energy-related project costs. Request the latest edition when ordering.

(3) *NIST "Building Life-Cycle Cost" (BLCC) Computer Programs, BLCC 5.3,* National Institute of Standards and Technology. This program uses as default values the same discount factors and energy price projections that underlie the discount factor tables in the Annual Supplement. Use version BLCC 5.3-09 for the period from April 1, 2009 to March 31, 2010. It is available for Windows and Linux.

BLCC 5.3 provides comprehensive economic analysis capabilities for the evaluation of proposed capital investments that are expected to reduce the long-term operating costs of buildings and building systems. It computes the LCC for project alternatives, compares project alternatives in order to determine which has the lowest LCC, performs annual cash flow analysis, and computes net savings (NS), savings-to-investment ratio (SIR), and adjusted internal rate of return (AIRR) for project alternatives over their designated study period. The BLCC program can be used to perform economic analysis of capital investment projects undertaken by federal, state, and local government agencies. In the application to federal energy conservation and renewable energy projects, BLCC5 is consistent with NIST Handbook 135, and the federal life-cycle cost methodology and procedures described in 10 CFR 436A and OMB Circular A-94.

The BLCC5 User's Guide is part of its Help system. BLCC 5.3 has six modules, all of them consistent with the life-cycle cost methodology of 10 CFR 436A, but programmed to include default inputs and nomenclature for specific uses:

- **FEMP Analysis, Energy Project**
  for energy and water conservation and renewable energy projects under the FEMP rules, agency-funded;

- **Federal Analysis, Financed Project**
  for federal projects financed through Energy Savings Performance Contracts (ESPC) or Utility Energy Services Contracts (UESC) as authorized by Executive Order 13123 (6/99);

- **OMB Analysis, Federal Analysis, Projects subject to OMB Circular A-94**
  for projects subject to OMB Circular A-94 (most other, non-energy, federal government construction projects, but not water resource projects);

- **MILCON Analysis, Energy Project**
  for energy and water conservation and renewable energy projects in military construction, agency-funded;

- **MILCON Analysis, ECIP Project**
  for energy and water conservation projects under the Energy Conservation Investment Program (ECIP).

INTRODUCTION

This report provides tables of present-value factors for use in the life-cycle cost analysis of capital investment projects for federal facilities. It also provides energy price indices based on Department of Energy (DOE) forecasts from 2009 to 2039. The factors and indices presented in this report are useful for determining the present value of future project-related costs, especially those related to operational energy costs. Discount factors included in this report are based on two different federal sources: (1) the DOE discount rate for projects related to energy conservation, renewable energy resources, and water conservation; and (2) Office of Management and Budget (OMB) discount rates from Circular A-94 for use with most other capital investment projects in federal facilities.

The DOE discount and inflation rates for 2009 are as follows:

Real rate (excluding general price inflation):	3.0 %
Nominal rate (including general price inflation):	4.2 %
Implied long-term average rate of inflation:	1.2 %

The DOE nominal discount rate is based on long-term Treasury bond rates averaged over the 12 months prior to the preparation of this report. The nominal, or market, rate is converted to a real rate to correspond with the constant-dollar analysis approach used in most federal life-cycle cost (LCC) analyses. The method for calculating the real discount rate from the nominal discount rate is described in 10 CFR 436 and uses the projected rate of general inflation published in the most recent Report of the President's Economic Advisors, Analytical Perspectives. The procedure would result in a discount rate for 2009 lower than the 3.0 % floor prescribed in 10 CFR 436. Thus the 3.0 % floor is used as the real discount rate for FEMP analyses in 2009. The implied long-term average rate of inflation was calculated as 1.2 %. Federal agencies and contractors to federal agencies are required by 10 CFR 436 to use the DOE discount rates when conducting LCC analyses related to energy conservation, renewable energy resources, and water conservation projects for federal facilities.

The nominal and real discount rates applicable to general (non-energy or water) capital investments are published annually in OMB Circular A-94, Appendix C. OMB has specified two basic types of discount rates: (1) a discount rate for public investment and regulatory analyses; and (2) a discount rate for cost-effectiveness, lease-purchase, and related analyses. Only discount rates for the second type of analyses are included in this Annual Supplement, since the primary purpose of this report is to support cost-effectiveness studies related to the design and operation of federal facilities.

OMB discount rates for cost-effectiveness and lease-purchase studies are based on interest rates on Treasury Notes and Bonds with maturities ranging from 3 to 30 years. Currently (as of January 2009) five maturities have been specifically identified by OMB, and are shown here with the corresponding real interest rate to be used as the discount rate for studies subject to OMB Circular A-94:

Maturity:	3-year	5-year	7-year	10-year	30-year
Rate:	0.9 %	1.6 %	1.9 %	2.4 %	2.7 %

OMB suggests that the actual discount rate for an economic analysis be interpolated from these maturities and rates, based on the study period used in the analysis. Due to limitations on the size of this Annual Supplement, discount factors for only two of these maturities are presented: factors for short term analyses (up to 10 years) based on the 7-year real rate (1.9 %), and factors for long-term

Table Ba-2. FEMP UPV* Discount Factors adjusted for fuel price escalation, by end-use sector and fuel type.

Discount Rate = 3.0 % (DOE)

Census Region 2 (Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, Wisconsin)

	RESIDENTIAL				COMMERCIAL					INDUSTRIAL					TRANSPORT	
N	Elec	Dist	LPG	NtGas	Elec	Dist	Resid	NtGas	Coal	Elec	Dist	Resid	NtGas	Coal	Gasln	N
1	0.94	0.72	0.88	0.96	0.90	0.70	1.39	0.96	0.95	0.87	0.70	1.33	0.92	0.95	0.93	1
2	1.87	1.47	1.80	1.92	1.78	1.44	3.20	1.92	1.89	1.70	1.45	3.03	1.88	1.90	1.97	2
3	2.78	2.30	2.80	2.84	2.63	2.28	5.16	2.86	2.82	2.51	2.30	4.87	2.82	2.83	3.09	3
4	3.68	3.18	3.84	3.74	3.46	3.19	7.24	3.76	3.72	3.29	3.23	6.82	3.73	3.74	4.25	4
5	4.57	4.10	4.93	4.60	4.27	4.15	9.39	4.63	4.62	4.06	4.21	8.85	4.64	4.64	5.43	5
6	5.44	5.06	6.05	5.44	5.07	5.16	11.63	5.49	5.50	4.81	5.23	10.95	5.55	5.52	6.64	6
7	6.29	6.05	7.19	6.27	5.85	6.18	13.90	6.34	6.36	5.55	6.27	13.08	6.45	6.37	7.87	7
8	7.12	7.04	8.33	7.09	6.63	7.22	16.17	7.19	7.19	6.29	7.32	15.22	7.35	7.20	9.10	8
9	7.93	8.04	9.48	7.90	7.39	8.27	18.44	8.02	8.01	7.01	8.37	17.35	8.25	8.00	10.33	9
10	8.73	9.03	10.61	8.70	8.14	9.31	20.69	8.86	8.79	7.72	9.42	19.47	9.15	8.79	11.55	10
11	9.51	10.00	11.71	9.51	8.88	10.33	22.90	9.69	9.56	8.43	10.46	21.55	10.06	9.55	12.76	11
12	10.27	10.96	12.80	10.31	9.60	11.33	25.07	10.52	10.31	9.12	11.47	23.58	10.96	10.29	13.95	12
13	11.02	11.89	13.86	11.09	10.32	12.31	27.19	11.34	11.03	9.80	12.45	25.58	11.85	11.02	15.10	13
14	11.74	12.80	14.89	11.85	11.01	13.27	29.27	12.12	11.73	10.47	13.42	27.53	12.70	11.71	16.24	14
15	12.44	13.70	15.90	12.57	11.69	14.21	31.30	12.88	12.41	11.11	14.36	29.43	13.52	12.40	17.34	15
16	13.11	14.56	16.88	13.28	12.34	15.12	33.24	13.61	13.07	11.74	15.27	31.26	14.31	13.06	18.40	16
17	13.77	15.41	17.83	13.97	12.98	16.01	35.14	14.33	13.72	12.35	16.17	33.04	15.09	13.70	19.45	17
18	14.41	16.24	18.75	14.65	13.60	16.88	36.99	15.05	14.35	12.94	17.04	34.78	15.86	14.34	20.46	18
19	15.03	17.05	19.67	15.33	14.21	17.73	38.82	15.76	14.96	13.53	17.90	36.50	16.64	14.95	21.45	19
20	15.64	17.85	20.56	16.01	14.80	18.58	40.60	16.47	15.56	14.10	18.75	38.17	17.42	15.56	22.44	20
21	16.24	18.64	21.43	16.68	15.39	19.41	42.35	17.18	16.15	14.67	19.58	39.82	18.20	16.15	23.40	21
22	16.83	19.42	22.29	17.34	15.96	20.23	44.08	17.88	16.73	15.22	20.41	41.44	18.98	16.73	24.34	22
23	17.39	20.20	23.14	18.00	16.52	21.04	45.79	18.57	17.28	15.76	21.22	43.05	19.75	17.29	25.26	23
24	17.94	20.96	23.97	18.64	17.07	21.84	47.47	19.25	17.83	16.29	22.02	44.63	20.51	17.83	26.17	24
25	18.48	21.71	24.79	19.28	17.60	22.63	49.14	19.92	18.35	16.81	22.81	46.19	21.26	18.36	27.06	25
26	19.01	22.45	25.59	19.90	18.12	23.41	50.78	20.58	18.86	17.31	23.59	47.73	22.01	18.88	27.94	26
27	19.52	23.18	26.38	20.52	18.63	24.18	52.40	21.24	19.36	17.81	24.36	49.26	22.75	19.38	28.81	27
28	20.01	23.90	27.16	21.13	19.13	24.95	54.00	21.88	19.85	18.29	25.12	50.76	23.48	19.87	29.66	28
29	20.50	24.62	27.93	21.73	19.61	25.70	55.58	22.52	20.32	18.76	25.87	52.24	24.21	20.34	30.50	29
30	20.97	25.32	28.69	22.32	20.09	26.44	57.14	23.14	20.77	19.22	26.61	53.71	24.93	20.80	31.32	30

See p. 14 for instructions on use; page xiii for abbreviations.

Table Ca-2. Projected fuel price indices (excluding general inflation), by end-use sector and fuel type.

Census Region 2 (Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, Wisconsin)

Projected April 1 Fuel Price Indices (April 1, 2009 = 1.00)

Sector and Fuel	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Residential															
Electricity	0.97	0.99	1.00	1.01	1.03	1.04	1.05	1.06	1.06	1.07	1.08	1.09	1.09	1.09	1.09
Distillate Oil	0.74	0.79	0.91	0.99	1.07	1.15	1.21	1.26	1.30	1.33	1.35	1.36	1.37	1.38	1.40
LPG	0.90	0.98	1.09	1.18	1.26	1.34	1.40	1.45	1.49	1.52	1.53	1.55	1.55	1.57	1.58
Natural Gas	0.99	1.02	1.01	1.00	1.00	1.00	1.02	1.04	1.06	1.08	1.11	1.14	1.15	1.14	1.13
Commercial															
Electricity	0.93	0.93	0.93	0.93	0.94	0.95	0.96	0.98	0.99	1.01	1.02	1.04	1.05	1.05	1.05
Distillate Oil	0.72	0.79	0.91	1.03	1.12	1.20	1.26	1.32	1.37	1.40	1.42	1.43	1.44	1.45	1.46
Residual Oil	1.44	1.92	2.14	2.33	2.50	2.67	2.79	2.88	2.97	3.02	3.06	3.09	3.12	3.14	3.16
Natural Gas	0.99	1.02	1.02	1.01	1.02	1.03	1.05	1.07	1.09	1.12	1.16	1.18	1.20	1.19	1.18
Coal	0.98	1.00	1.01	1.02	1.04	1.05	1.05	1.06	1.06	1.06	1.06	1.07	1.06	1.06	1.06
Industrial															
Electricity	0.89	0.88	0.88	0.88	0.89	0.90	0.91	0.93	0.94	0.96	0.98	0.99	1.00	1.01	1.01
Distillate Oil	0.72	0.80	0.93	1.05	1.14	1.22	1.27	1.33	1.38	1.41	1.43	1.44	1.45	1.46	1.47
Residual Oil	1.37	1.80	2.01	2.19	2.35	2.51	2.62	2.71	2.79	2.84	2.88	2.91	2.93	2.95	2.97
Natural Gas	0.95	1.01	1.03	1.03	1.05	1.08	1.11	1.14	1.17	1.21	1.25	1.29	1.31	1.29	1.27
Coal	0.98	1.00	1.02	1.03	1.04	1.04	1.05	1.05	1.05	1.05	1.06	1.06	1.06	1.06	1.06
Transportation															
Motor Gasoline	0.96	1.11	1.22	1.30	1.37	1.45	1.51	1.56	1.61	1.64	1.67	1.69	1.70	1.71	1.72

Table Ca-2, continued. Projected fuel price indices (excluding general inflation), by end-use sector and fuel type.

Census Region 2 (Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, Wisconsin)

Projected April 1 Fuel Price Indices (April 1, 2009 = 1.00)

Sector and Fuel	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039
Residential															
Electricity	1.09	1.08	1.09	1.09	1.10	1.11	1.12	1.12	1.12	1.13	1.13	1.13	1.14	1.14	1.14
Distillate Oil	1.39	1.39	1.41	1.43	1.45	1.47	1.49	1.52	1.55	1.57	1.60	1.63	1.65	1.68	1.71
LPG	1.56	1.57	1.58	1.60	1.61	1.63	1.65	1.67	1.69	1.71	1.74	1.76	1.78	1.81	1.83
Natural Gas	1.13	1.14	1.16	1.20	1.22	1.25	1.27	1.29	1.31	1.33	1.35	1.37	1.39	1.41	1.44
Commercial															
Electricity	1.05	1.05	1.05	1.06	1.08	1.09	1.10	1.10	1.11	1.12	1.12	1.13	1.14	1.15	1.15
Distillate Oil	1.46	1.47	1.48	1.50	1.53	1.55	1.57	1.60	1.63	1.65	1.68	1.71	1.74	1.77	1.81
Residual Oil	3.13	3.13	3.16	3.20	3.22	3.26	3.31	3.37	3.43	3.48	3.54	3.60	3.66	3.72	3.79
Natural Gas	1.17	1.19	1.22	1.25	1.28	1.32	1.34	1.36	1.38	1.41	1.43	1.45	1.48	1.50	1.52
Coal	1.06	1.07	1.07	1.08	1.08	1.10	1.10	1.10	1.10	1.10	1.10	1.11	1.11	1.11	1.11
Industrial															
Electricity	1.01	1.01	1.01	1.02	1.04	1.05	1.06	1.07	1.07	1.08	1.09	1.10	1.11	1.11	1.12
Distillate Oil	1.46	1.48	1.48	1.50	1.54	1.55	1.57	1.60	1.63	1.66	1.68	1.71	1.74	1.77	1.80
Residual Oil	2.94	2.94	2.96	3.00	3.03	3.06	3.11	3.17	3.22	3.27	3.33	3.38	3.44	3.50	3.56
Natural Gas	1.27	1.28	1.32	1.37	1.41	1.45	1.48	1.52	1.55	1.58	1.61	1.64	1.68	1.71	1.75
Coal	1.06	1.07	1.08	1.08	1.09	1.10	1.11	1.11	1.11	1.11	1.11	1.11	1.12	1.12	1.12
Transportation															
Motor Gasoline	1.71	1.72	1.73	1.74	1.79	1.78	1.80	1.82	1.85	1.87	1.90	1.92	1.95	1.98	2.01

Table Cb-2. Projected average fuel price escalation rates, excluding general inflation, by end-use sector and fuel type.

Census Region 2 (Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, Wisconsin)

Percentage change compounded annually

Sector and Fuel	2009 to 2014	2014 to 2019	2019 to 2024	2024 to 2029	2029 to 2034	2034 to 2039
Residential						
Electricity	0.6	0.8	0.3	0.3	0.4	0.3
Distillate Oil	1.3	4.5	1.0	0.7	1.7	1.7
LPG	4.7	3.8	0.8	0.4	1.3	1.4
Natural Gas	0.0	1.6	0.9	1.6	1.7	1.5
Commercial						
Electricity	-1.2	1.4	0.9	0.5	0.7	0.6
Distillate Oil	2.3	4.6	0.9	0.9	1.6	1.8
Residual Oil	20.1	3.9	0.9	0.4	1.6	1.7
Natural Gas	0.3	2.0	1.0	1.7	1.8	1.6
Coal	0.8	0.3	0.0	0.5	0.4	0.1
Industrial						
Electricity	-2.4	1.6	0.9	0.6	0.8	0.7
Distillate Oil	2.7	4.3	0.8	1.0	1.4	1.7
Residual Oil	18.6	3.9	0.9	0.4	1.6	1.7
Natural Gas	1.0	2.9	1.0	2.0	2.3	2.1
Coal	0.8	0.3	0.2	0.5	0.4	0.1
Transportation						
Motor Gasoline	6.5	3.7	0.9	0.8	0.9	1.4

PROJECT green

Proud Member of KY EXCEL

Sponsored By: STATE FARM INSURANCE

home | ideas | calculators | at home | at work | on the road | kids | glossary

Back to Project Green

SHARE

Emission Reduction Calculator

Find out how much money you can save and the pollution you can reduce by investing in energy efficiency in your home or workplace!

Calculators

A/C Size | Carbon Footprint | Home Appliances | Emission Reduction | Pollution from Electricity | Your Diet & the Environment

Find out how much money you can save and the pollution you can reduce by investing in energy efficiency in your home or workplace!

You can save yourself money and help clean up the environment by reducing your energy consumption with easy-to-do energy efficiency measures.

Enter Your Estimated Annual Electricity Reduction (kWh): 1000

Enter Your Estimated Annual Natural Gas Reduction (therms): 1000

Enter fuel use increases as negative numbers for fuel switching measures (To convert MMBtu to therms, multiply MMBtu by 10).

Select Your Customer Type: Commercial

Select Your State: Nebraska

Emission Reduction and Cost Savings Results:

Your Estimated Annual Cost Savings: $ 1079

(Calculated using eGRID2006 Version 2.1 State File (Year 2004 Data) average electric generation emission factors and average electricity rate by customer type from U.S. DOE's Electric Sales, Revenue, and Average Price 2005 and Natural Gas Monthly May 2007 for the selected state)

Your Energy Efficiency Efforts Will Also Result in the Following Pollution Reductions:

Type of Pollution	Amount of Reduction per Year	
Greenhouse Gases (CO_2)	14164	Pounds
Nitrogen Oxides (NO_x)	20	Pounds
Sulfur Dioxide (SO_2)	9	Pounds
Toxic Metals Pollution	**Amount of Reduction per Year**	
Mercury (Hg)	21	Milligrams

More Stories

- Related Green Resources
- Green Glossary
- 10 Everyday Pollution Solutions
- Environmental Shopping Tips
- Energy Saving Tips
- Earth Facts
- The History of Earth Day
- Wise Water Use - Kentucky American Water

Video Player

00:00

PROJECT GREEN VIDEOS

Simple Savings:... 02:52
Simple Savings:... 03:45
Simple Savings:... 02:01
Simple Savings:... 03:15
Blue Grass... 00:31
Blue Grass... 00:31

◄ PREVIOUS 1 | 2 | 3 NEXT ►

SEARCH GO►

thedailygreen.com news feed

Obama Halts Largest Mountaintop Removal Mine Project
Fri, 11 Sep 2009 08:43:00 EST
As coal miners and environmental advocate await a ruling on new mountaintop removal mining permits, a good sign from an Administration with a mixed record on the issue.

Today's Arctic Circle Comic Strip
Fri, 11 Sep 2009 01:01:00 EST

SPONSORED BY:

more news
get this widget

Helpful Links

- Recycling Centers in Kentucky
- Kentucky Department of Waste Management
- How to establish a paper recycling program
- eWaste: Information on reuse and recycling
- Greener Choices: Electronics Reuse & Recycling Center
- First Lady Jane Beshear's Green Team